apple service

LEVEL I
TECHNICAL PROCEDURES
#072-0062
VOLUME V

TECHNICAL PROCEDURES MANUAL

February, 1986 Edition

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Disk Drives

DISK II TECHNICAL PROCEDURES

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Disk Drives Technical Procedures

Section 1

Drive Acceptance Program

The Drive Acceptance Program (DAP) performs a brief check of the major functions on Apple 5 1/4 inch disk drives. It is not a complete functional test. (A program to test all functions would take an impractical amount of time.) It is, therefore, possible that in rare cases the DAP may fail a good drive or pass a bad one.

If you are presented with a drive which passes the DAP but which you know is bad, refer to "What to do if a Test Fails" (below) and perform the steps for Test 3.

If you have a drive which fails (the program stops) during a DAP test, try using another DDD diskette (see **Required Materials**, below). If the program stops again, refer to the section "What to do if a Test Fails" and perform the steps for the test that failed.

Required Materials

1. A formatted write-protected diskette.

2. A formatted non-write-protected diskette.

3. Drive Acceptance Program diskette (P/N 077-8101). This program can be copied. However, care should be taken to use two known good drives in copying, and to copy from the original diskette.

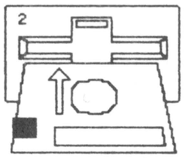
4. Digital Diagnostic Diskette (DDD™*). (P/N 689-8024). This diskette cannot be copied without special equipment.

5. Apple][+, //e (disk controller in slot 6), //c, or Apple /// (emulation mode) and properly configured disk drive.

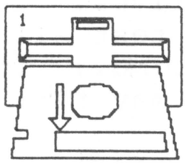
NOTE: After booting the program, icons or pictures show you what you need to do to run each test. If any test fails at any point, the program stops. Refer to the section "What to do if a Test Fails" for servicing instructions.

* DDD is a registered trademark of Dysan, Inc.

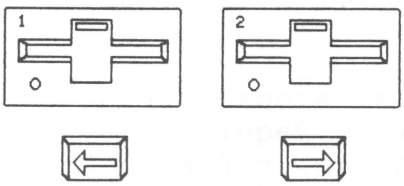
Icons and What They Mean



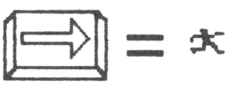
Insert write-protected, formatted diskette. (Arrow pointing toward drive means "Insert the diskette".)



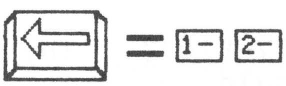
Remove non-write-protected, formatted diskette. (Arrow pointing away from drive means "Remove the diskette".)



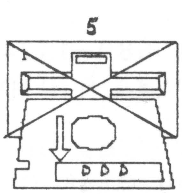
Press left arrow to select drive 1 and right arrow to select drive 2.



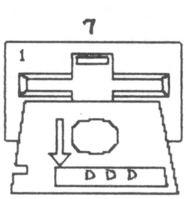
Press right arrow to start the program or when ready to continue.



Press left arrow to start over and reselect a drive.



Drive 1 has failed Test 5. Remove the Digital Diagnostic Diskette (DDD) from the drive. The number above the drive tells which test is running.



Drive 1 has passed Test 7 (and all previous tests). Remove the Digital Diagnostic Diskette (DDD) from the drive. (The DAP is finished and the drive has passed.)

* DDD is a registered trademark for Dysan, Inc.

Running the Diagnostics

IF YOU ARE TESTING A DRIVE THAT WON'T BOOT, CONNECT IT TO THE SYSTEM AS DRIVE 2 AND BOOT THE DRIVE ACCEPTANCE PROGRAM IN DRIVE 1. IF YOU DO NOT KNOW HOW TO DO THIS, REFER TO THE TECHNICAL PROCEDURES FOR THE SPECIFIC DISK DRIVE THAT YOU ARE WORKING ON.

NOTE: Dots below the drive indicate how much longer the test will take to finish. If a test fails at any point, the program stops and indicates a failure by showing the failed drive with an X over it.

1. Boot the Drive Acceptance Program in drive 1 of an Apple][Plus, //e, //c, or, using emulation mode, in an Apple ///. Two drive icons will appear on the monitor along with a left arrow and a right arrow.

2. Select the drive to be tested. (Press left arrow for drive 1 or right arrow for drive 2.)

3. Insert the formatted write-protected diskette in the drive selected.

4. Press right arrow to start the test. The number above the drive indicates which test is running. (At this point it should be Test 1.) When the test is done, icons direct you to remove the write-protected diskette and insert the non-write-protected diskette.

5. Insert the formatted non-write-protected (Read/Write Tests) diskette. Press the right arrow to start the test. The dots below the icon indicate how much longer the test will take. When the test is done, Icons will direct you to remove the non-write-protected diskette and insert the DDD. Even though the motor is still running, remove the non-write-protected dikette.

6. While the drive motor is running, <u>carefully</u> insert the DDD diskette (it is precision media). Start the test by pressing the right arrow. Tests 4 through 7 will run in sequence. If test 4 (Eccentricity) fails, icons will prompt you to remove and reinsert the DDD diskette to make sure that the diskette is properly clamped. Press the right arrow to restart test 4. If test 4 fails a second time, the Drive Acceptance Program will stop. Otherwise, tests 5, 6, and 7 will run in sequence until a test fails or the drive passes.
   NOTE: The DDD diskette cannot be copied.

When all tests have passed or the program stops because the drive has failed, pressing any key returns to Drive Selection.

* DDD is a registered trademark for Dysan, Inc.

What to Do If a Test Fails

The chart on page 1.5 tells you what to do if the DAP indicates a failure while you are running it. First locate the number of the test that failed. Next look under the column that tells the kind of drive that was being tested when it failed. Either one or several steps of corrective action will be shown. When several steps are shown, complete the first and then rerun the DAP to see if the drive passes. If it does not, replace any parts you might have swapped and do whatever the second step tells you. Continue with this procedure until the drive is repaired and the DAP passes, or until you have completed all of the steps suggested.

Disk Drives Technical Procedures

Section 2

Disk Drive Preventive Maintenance

PROTECT YOUR MEDIA

Sometimes "disk drive problems" are really media problems, caused by the way the customer stores his disks. Make sure your customers know to keep disks away from dust, heat, electromagnetic inducing devices such as power supplies, CRTs, magnets, and the power/sweep PCB on the left side of a Macintosh.

YOU WILL NEED

1. Q-tips
2. Solution of 80% denatured alcohol and 20% deionized or distilled water

INSTRUCTIONS

The following preventive maintenance procedures should be performed whenever a repair or adjustment is done on a disk drive.

DISK II AND DISK ///

1. Remove the cover and clean the guide rails (the metal shafts that the head slides on) with the alcohol/water solution. Do not use grease.

2. Inspect the head for worn or dull spots in the ceramic. If you find any, replace the assembly containing the head.

3. Clean the head with the alcohol/water solution.

4. Remove the bottom of the drive and inspect the disk drive belt for cracks, slippage, and elasticity (should not be dry and cracked). Replace if necessary.

5. Move the head assembly back and forth along its full length of travel. Check for blockage and smooth easy movement.

DUODISK AND UNIDISK

1. Remove the cover, the shield(s) and the analog PCB. Then perform steps 1 through 5 as explained in **DISK II AND DISK ///** above.

2. Locate the spring connected to the head drive band. Make sure that it is holding the band reasonably taut.

APPLE IIc DISK DRIVE

1. Remove the disk drive from the Apple IIc and remove the mechanical assembly from the disk drive. Then perform steps 1 through 5 as explained in **DISK II AND DISK ///**, above.

2. Locate the spring connected to the head drive band. Make sure that it is holding the band reasonably taut.

MAC EXTERNAL DRIVE

No preventive maintenance is required on this drive. However, it is recommended that it be used only on the right hand side of the Macintosh. This helps keep any electromagnetic interference from the power/sweep PCB from affecting disk drive operation.

Disk II

apple computer

DISK][TECHNICAL PROCEDURES

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Disk][Technical Procedures

Section 1

Take-apart

Contents:

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DRIVE ACCEPTANCE PROGRAM

This program will test the working condition of a 5 1/4 inch disk drive. After booting the program, icons or pictures show you what you need to do to run each test. If any test fails at any point, the program stops. Refer to the section "What to do if a Test Fails" for servicing instructions.

Required Materials

1. A formatted write-protected diskette.

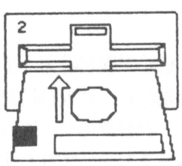
2. A formatted non-write-protected diskette.

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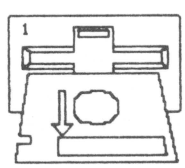
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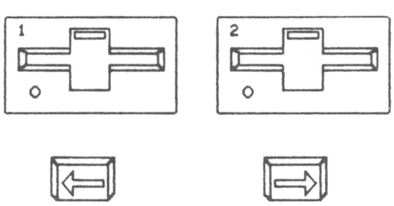
Icons and What They Mean



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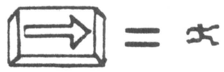


Remove non-write-protected, formatted diskette. (Arrow pointing away from drive means "Remove the diskette".)

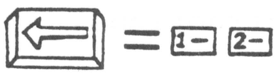


Press left arrow to select drive 1 and right arrow to select drive 2.

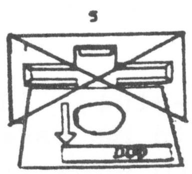
* DDD is a registered trademark for Dysan, Inc.



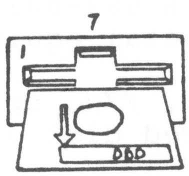
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Press left arrow to start over and reselect a drive.



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NOTE: Dots below the drive indicate how much longer the test will take to finish. If a test fails at any point, the program stops and indicates a failure by showing the failed drive with an X over it.

1. Boot the Drive Acceptance Program in drive 1 of an Apple][Plus, //e, //c, or, using emulation mode, in an Apple ///. Two drive icons will appear on the monitor along with a left arrow and a right arrow.

2. Select the drive to be tested. (Press left arrow for drive 1 or right arrow for drive 2.)

3. Insert the formatted write-protected diskette in the drive selected.

A. REMOVING THE DISK DRIVE COVER

1. Power off the system.

2. Remove the Apple lid.

3. Unplug the disk interface card and lay it gently to one side.

4. Close the disk drive door.

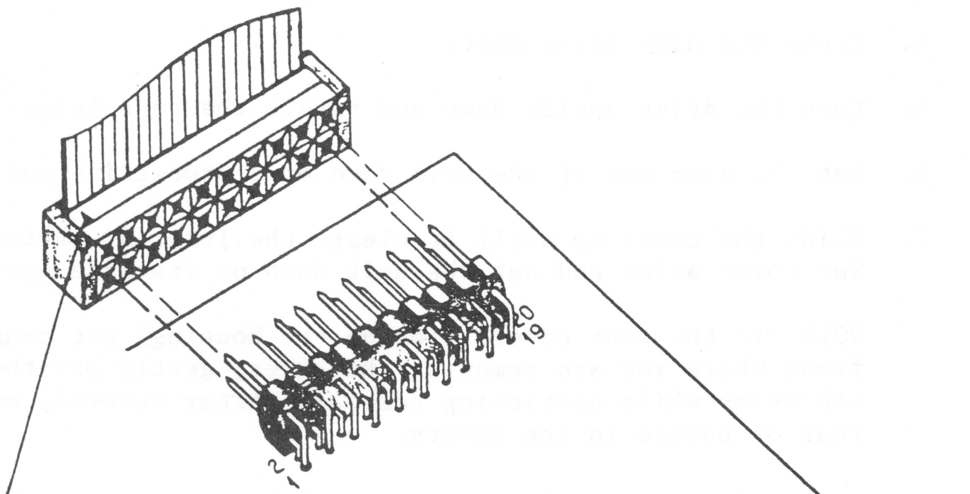
5. Turn the drive upside down and remove the four screws.

6. Set the door end of the unit down on a protective pad.

7. Slide the cover up until it clears the interior parts of the drive. Set cover aside and set the unit down on its base again.

   NOTE: If the vent covers (inside the housing) get caught on the frame while you are removing the cover, gently pry them away from the frame while continuing removal. After removal, smooth out any tear or bubble in the covers.

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ARROW SHOULD BE UP WHEN CONNECTOR IS INSTALLED.

YOU CAN PERMANENTLY DAMAGE THE DISK DRIVE IF YOU ATTACH THE CABLE INCORRECTLY. HERE IS HOW TO DO IT RIGHT:

1. THE CABLE LEAVES THE CONNECTOR ON THE SIDE **AWAY** FROM THE CARD.

2. MAKE SURE **ALL** PINS GO INTO THEIR MATCHING HOLES.

FIGURE 1

B. REPLACING THE DISK DRIVE CABLE

Removing the Cable:

1. Power down the Apple. Remove the disk drive cover.

2. Release the catch on the nylon cable holder (mounted on the inside of the back plate) by pressing the tab toward the back of the unit. Disconnect the cable from the analog card and lift the cable free of the drive.

3. Gently disconnect the other end of the ribbon cable from the interface card in the Apple. If the cable is a shielded "RFI" cable, loosen the clamping screw and remove the cable from the clamp.

Replacing the Cable:

4. Place the cable into the nylon cable holder so that the toroids (donut-shaped ferrite pieces) are just below the cable holder, and snap the holder shut.

5. Attach the ribbon cable plug to the connector on the analog card, making sure that both rows of pins align with the holes in the plug and that the arrow on the plug points to pin 1 on the connector. (The cable should exit away from the analog card.)

6. Replace the disk drive cover.

7. Then carefully attach the ribbon cable to the interface card, as shown in figure 1.

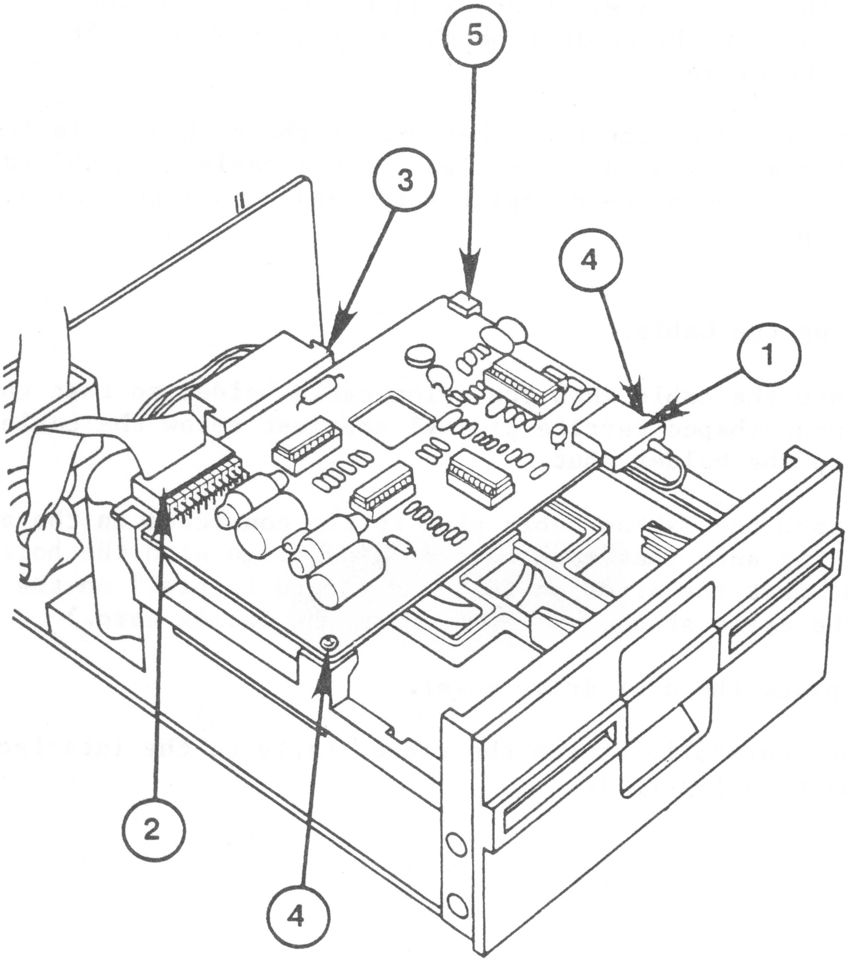


FIGURE 2

C. REPLACING THE ANALOG CARD

Removing the Analog Card:

1. Power down.

2. Remove the disk drive cover.

3. Gently remove the read/write head plug from the front of the analog card (Figure 2, #1).

4. Gently remove the ribbon cable plug from the rear of the card (#2).

5. Gently remove the motor plug from the rear of the card (#3).

6. Remove the two screws at the front of the analog card (#4).

   NOTE: These screws may have either standard or metric threads. To avoid intermixing, keep the screws with the disk drive they were taken from.

7. Slide the card forward past the retaining slots at the rear (#5), and then lift it out.

Replacing the Analog Card

8. Slide the card into position in the slots of the rear support posts (Figure 2, #5).

9. Reinstall the two screws (#4) to hold the card in place.

10. Attach the head plug (#1) to the card. Make sure that there is just enough loop in the cable so that it doesn't pull down on the head plug.

11. Attach the motor plug (#3) at the rear of the card.

12. Attach the ribbon cable plug (#2) at the rear of the card, making sure that both rows of pins align with holes in the connector.

13. Replace the disk drive cover.

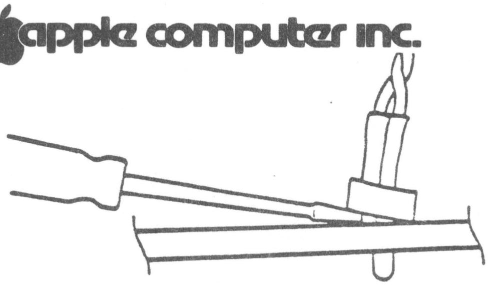


FIGURE 3

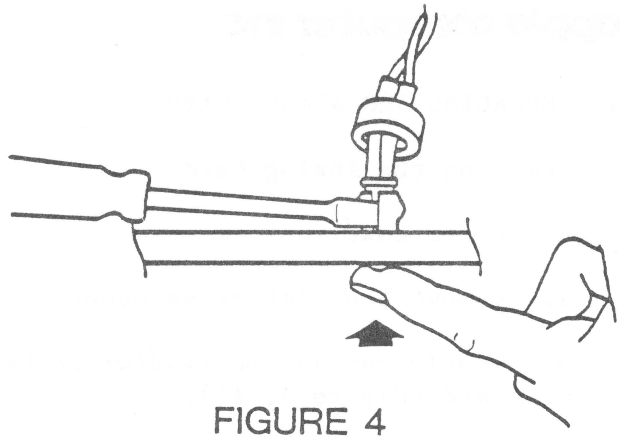


FIGURE 4

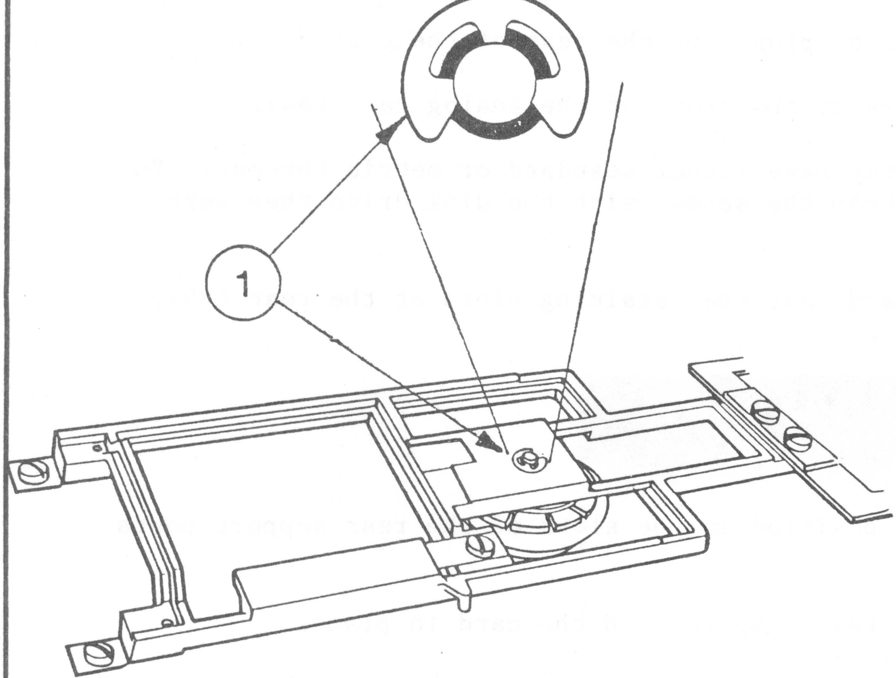


FIGURE 5

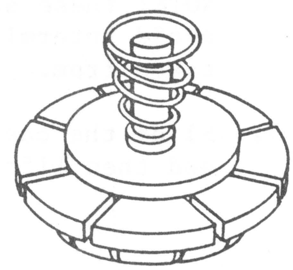


FIGURE 6

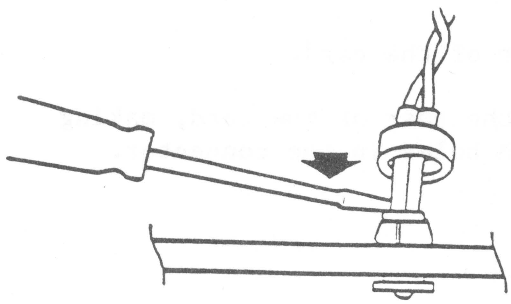


FIGURE 7

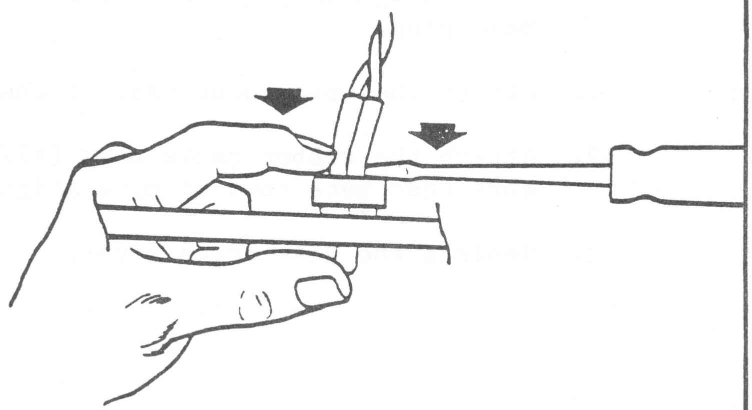


FIGURE 8

D. REPLACING THE COLLET HUB

Removing the Old Collet Hub

1. (Power off.) Remove the disk drive cover and analog card.

2. Remove the two screws on each side of the front bezel (front panel) of the unit.

3. Slide the bezel off the unit. If the bezel cannot be removed because the wires connecting the LED are too short, remove the LED as follows:

   a. Pry the small plastic retaining ring from around the LED holder with a screwdriver (Fig. 3). Slide the retaining ring up the wires and out of the way.

   b. Press the face of the LED in towards the drive, while gently prying apart the LED holder with a screwdriver (Fig. 4), until the LED snaps free of the bezel.

   c. Remove the bezel from the unit.

4. With a screwdriver, pry the retaining clip (Fig. 5, #1) off the shaft holding the collet.

5. Remove the collet hub assembly (Fig. 6); remove the spring and washer from the collet hub. (Remove the spring carefully, taking care not to stretch it.)

Installing the New Collet Hub

6. Place the washer and spring on the shaft of the new collet hub--the spring goes on small end down--and insert into the mounting arm.

7. Install the retaining clip.

8. Replace the bezel.

   NOTE: Make sure the door hinge pins fit properly in the slots on the back of the bezel. The hinge pins should be tilted back towards the collet hub during installation of the bezel.

9. If you removed the LED, replace it as follows:

   a. Slip the LED back in its holder and snap it into place with a screwdriver (Fig. 7).

   b. Slide the retaining ring down the wires and position it around the LED holder. Push the retaining ring back into place with a screwdriver (Fig. 8).

E. REPLACING THE HEAD LOAD BUTTON

The head load button is a small round pad of white felt, mounted in the head load arm (Fig. 9, #1), that holds the diskette surface against the read-write head. The button should sit just above the center of the read-write head, with its surface parallel to the surface of the head.

When the button is severely worn, it will look like a cylinder skewed to the right (as viewed from the front). At that point it should be replaced.

1. Lift up the Head Load Arm (Figure 9, #1), squeeze the top part of the load button with small needle-nose pliers, and let the button drop down.

2. Install a new load button by inserting it into the holder and pushing up until it snaps into place.

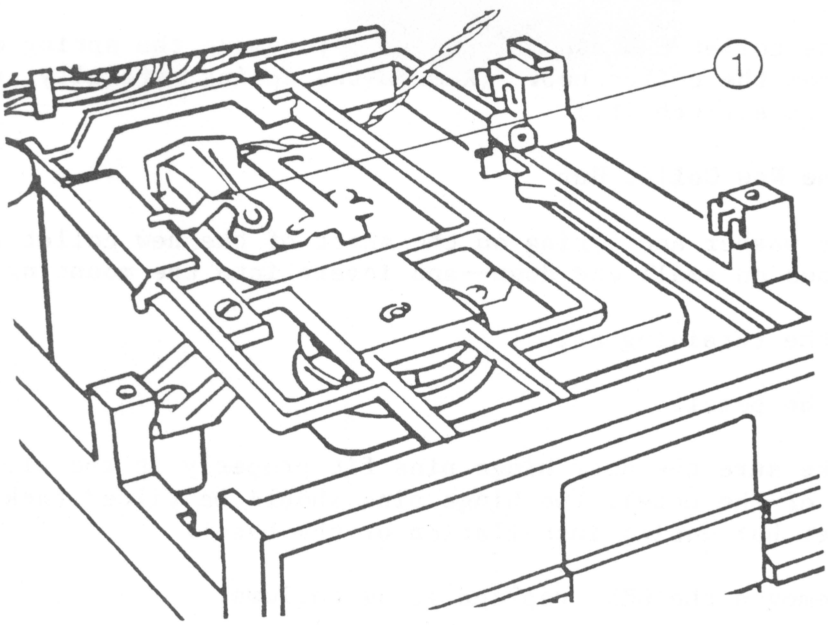


FIGURE 9

Disk][Technical Procedures

Section 2

Adjustments

Contents:

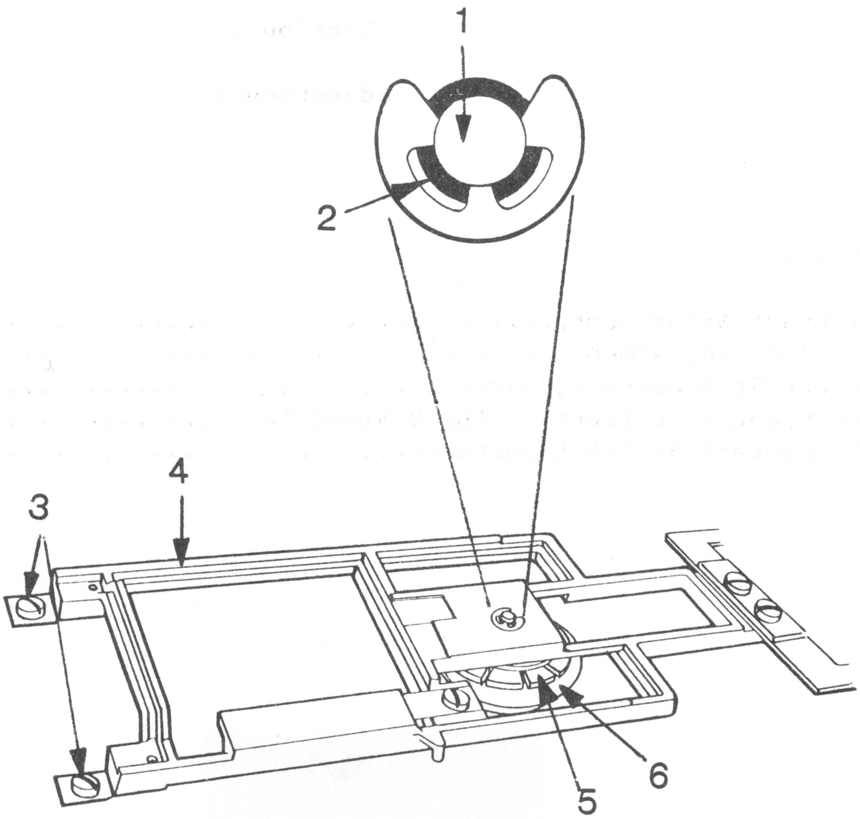


FIGURE 1

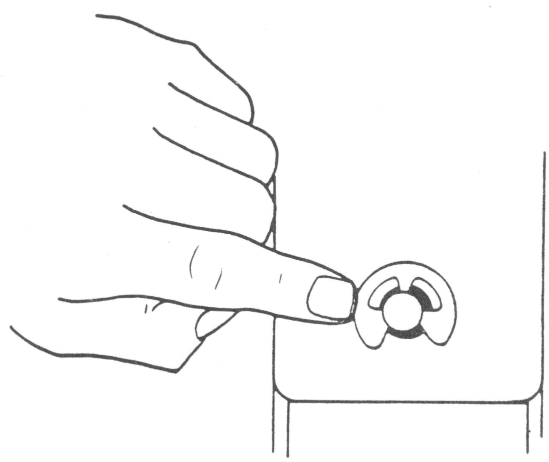


FIGURE 2

A. COLLET HUB ADJUSTMENT

If the diskette will not boot but you are able to get around the problem by opening and closing the drive door a few times, then the collet hub may need adjustment. Check it with the procedure below. If adjustment does not eliminate the booting problems, then the collet hub may need to be replaced (see section D above, p. 1.9).

TO CHECK ADJUSTMENT

1. Remove the analog card.

2. Looking straight down on the collet shaft (Figure 1, #1), close the door. Check to see that the shaft is centered.

3. Open and close the door again, observing to see that the collet hub moves cleanly into the center of its receptacle.

4. If the shaft is not centered (i.e., touches the side of the hole in the casting (Figure 1, #2)), go on to step 5.

TO ADJUST

5. Loosen the four screws (#3) on the bracket (#4): two on the back and two that hold the bracket to the door.

6. Close the door, and make sure that the collet hub (#5) is seated in its receptacle (#6).

7. Looking straight down on the collet shaft, move the bracket (#4) around until the shaft is dead center in the hole (#2).

8. Tighten the rear screws.

9. Check by repeating steps 2 and 3.

10. As a further check, open the door, push the collet shaft off-center (Figure 2), and then close and open the door a few times, making sure that the shaft reseats itself in the center of the hole.

11. As this procedure may affect the drive door adjustment, check the drive door adjustment as per section B (below, p. 2.5); readjust if necessary.

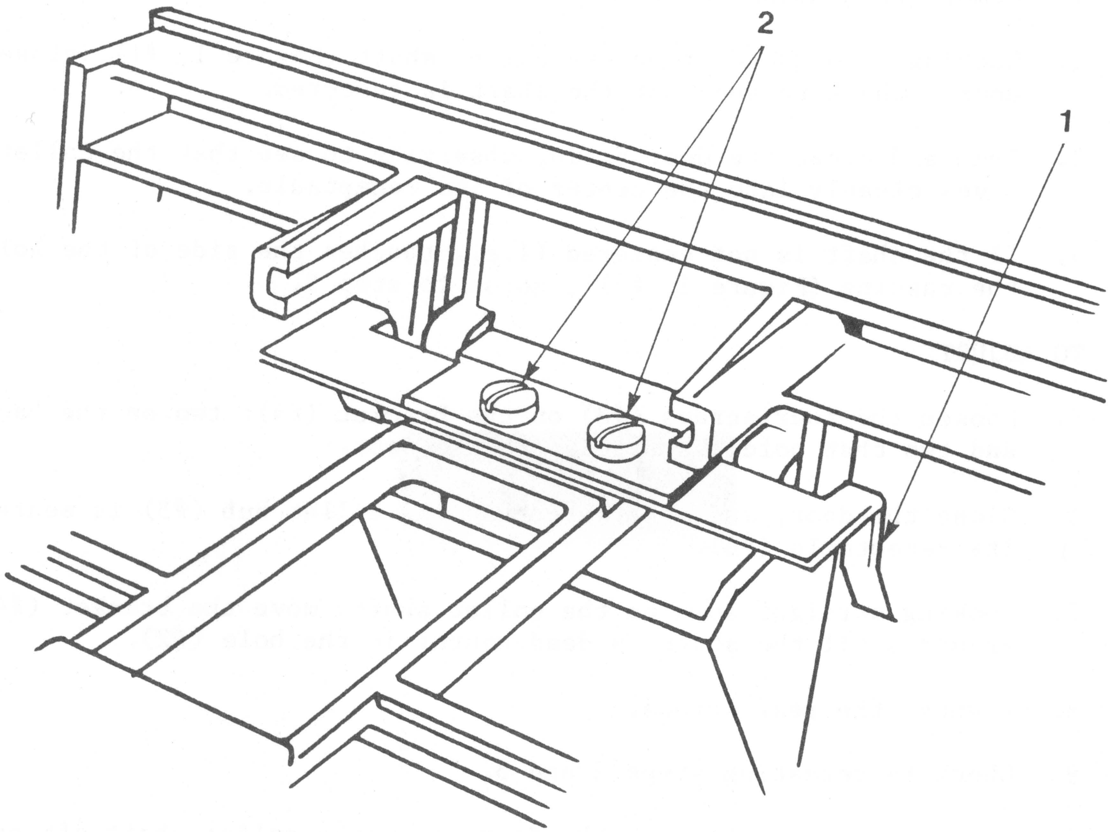


FIGURE 3

B. DRIVE DOOR ADJUSTMENT

When the disk drive door is closed, it should be centered in its slot and even with the surface of the bezel (front panel). If it appears out of alignment, or binds against the bezel or the diskette, perform the following adjustments.

1. (Power off.) Disconnect the drive from the Apple. Remove the cover and analog card.

2. Check the collet hub adjustment (see section A above (p. 2.3), step 2). The collet hub must be correctly adjusted before you adjust the door.

3. Loosen the two mounting screws (Fig. 3, #2) and center the door in its opening.

4. Check the door for evenness with the front of the bezel. Adjust the door if necessary; then tighten the door mounting screws.

5. Insert the Adjustment Tool into the drive and allow it to center properly.

6. While gently closing the drive door, observe the two guide bars (Figure 3, #1), which are visible when viewed from the back of the drive looking towards the front. There should be no binding between the guides and the tool.

7. If there is binding, or if the door is crooked, loosen the two door mounting screws (#2), close the door with the Adjustment Tool in place, and tighten the screws so that the guides just touch the tool with no binding.

C. DISKETTE STOP GUIDE ADJUSTMENT

The diskette stop guide is a piece of plastic that stops the diskette when it is far enough into the drive. It is almost never necessary to adjust it; in fact, on Alps models it has been eliminated as a separate component and incorporated into the casting itself.

Still, the Shugart stop guides get tinkered with, and when they are out of adjustment, the diskette can be so far off-center that it will be damaged when the collet hub seats itself.

TO ADJUST

1. (If the disk drive is connected to an Apple][, power off and disconnect the drive.) Remove the cover and analog card.

2. Insert the Disk Adjustment Tool.

3. See whether the tool is centered by gently closing the drive door and observing the collet hub. (When you close the drive door, the collet hub should seat itself directly in the hole in the center of the Adjustment Tool, and the tool should move very little.)

4. If the tool is too far forward or too far back, the stop guide is out of place. Loosen the stop guide mounting screw (accessible through the small round hole on the left side of the tool) and allow the guide to move back.

5. Center the Adjustment Tool correctly and gently close the drive door.

6. Adjust the stop guide so that it touches the Adjustment Tool; then tighten the mounting screw.

7. Apply Gliptol to the screw after you remove the Adjustment Tool.

D. DRIVE SPEED ADJUSTMENT -- THE D-SPEED TEST

If a drive will not boot disks, or gives many I/O error messages, or produces diskettes that other drives cannot read, it may be spinning too quickly or too slowly. This causes its reading and writing to be incompatible with that of other drives. The D-Speed test checks the speed of the drive so that you can adjust it to within standard tolerance.

The test works by writing a pattern to a scratch diskette and then reading it. If the test will not run, you may be using a defective scratch diskette; try another. If the test still will not run, the write-protect switch may be stuck in protect mode (see Write-Protect Switch Adjustment). If the test still will not run, replace the Analog Card with a known good one.

Adjusting the Speed:

1. Power down. Disconnect the customer's drive from his Apple.
2. Remove the cover of the customer's drive.
3. Using a known good interface card, connect the customer's drive to the DRIVE 2 position and a known good drive to the DRIVE 1 position. (Make sure all the pins are in the proper holes).
4. Using a known good Apple][, make sure power is down and then insert the interface card into slot 6.
5. Place the Disk Alignment Aid diskette in the known good drive and boot it.
6. When the menu comes up, SET TARGET DISK will be highlighted. Accept it by pressing A.
7. Set target for slot 6, drive 2, by pressing S, A, A. Press <ESC>.
8. Select D-SPEED test (press S, S, S, A).
9. The screen will warn you that the test will write on the diskette. Put a scratch diskette in the target drive and press A again.

   NOTE: At this point, the screen should show a scale with -100 on the left and +100 on the right, with a marker indicating the actual speed of the drive. The acceptable range is + or - 26. If the D-Speed is outside this range, proceed with the adjustment.
10. Look at the BACK of the drive mechanism. Locate the Motor Control Card, mounted on edge, and note the small trimpot with a screwdriver adjustment on the side (Figure 4, #1).

    NOTE: Do not confuse this with the trimpot(s) on the analog card!

11. Set the speed so that it indicates between -5 and 0. Press <ESC>, A, A. Allow the drive to run for 128 passes and confirm that the average D-speed is between -5 and 0. Readjust if necessary. Very erratic speed can sometimes be corrected by cleaning the pulleys with alcohol.

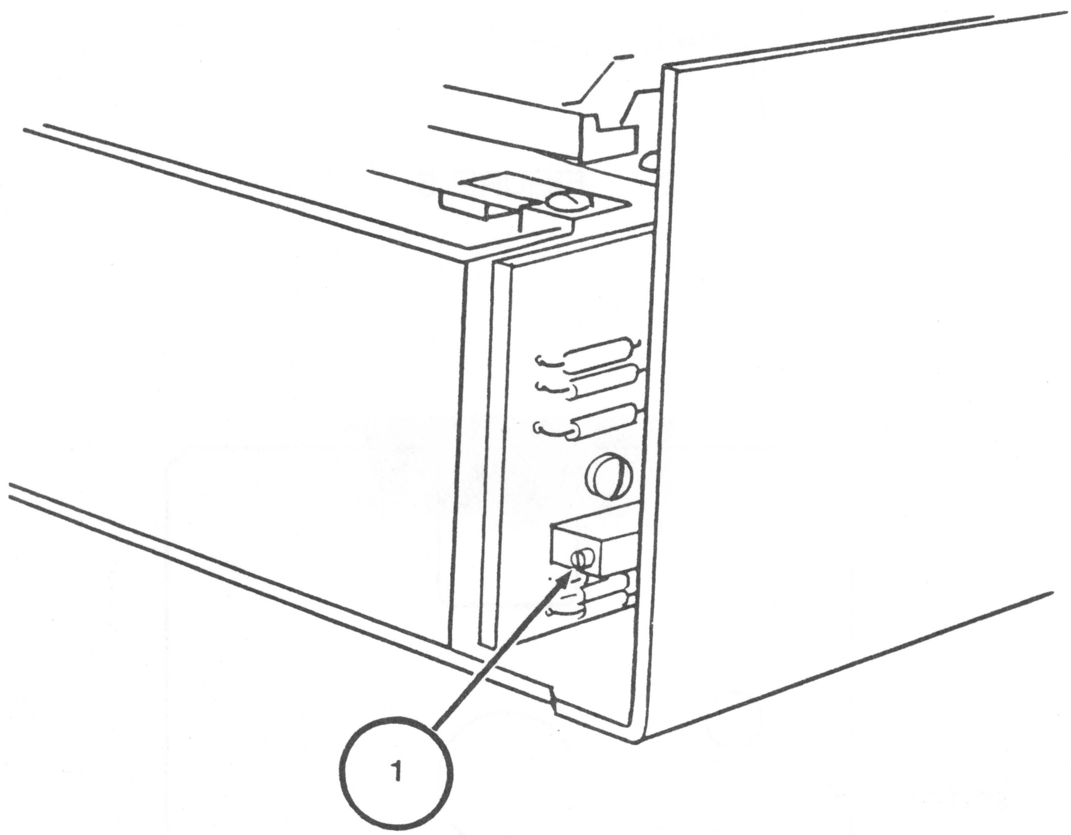


FIGURE 4

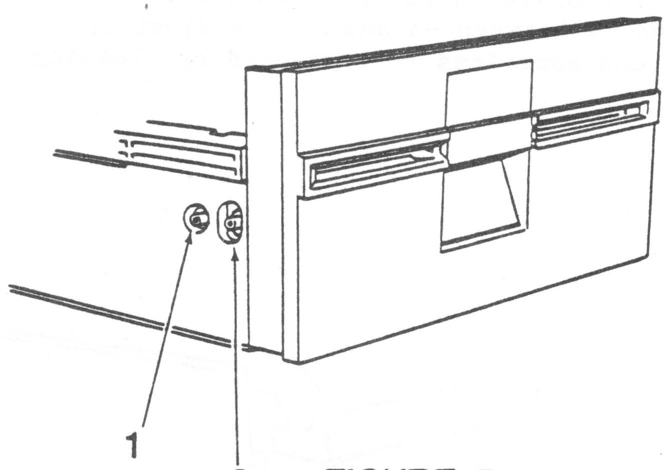


FIGURE 5

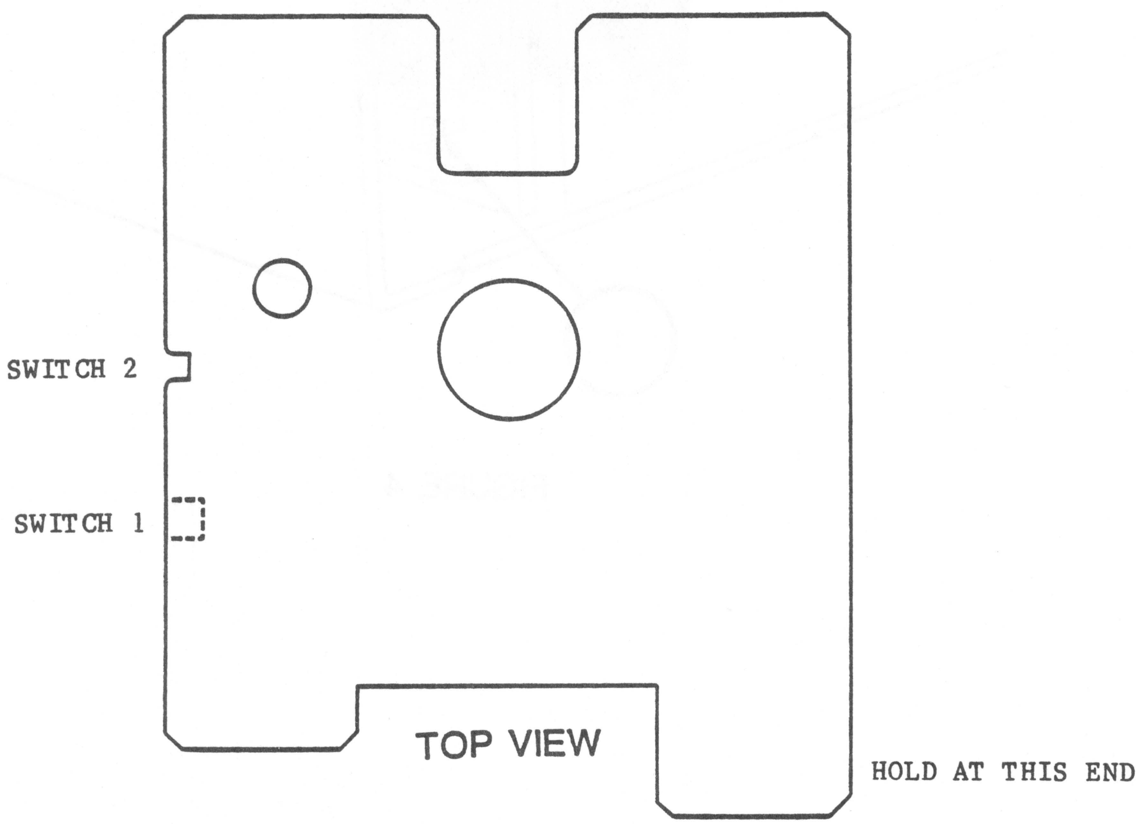


FIGURE 6

E. WRITE-PROTECT SWITCH ADJUSTMENT

If a customer complains that his system writes over write-protected diskettes, or refuses to write on non-protected diskettes, calling them "write-protected", then his write-protect switch may need adjustment or replacement. Before you replace it, try to adjust it using the following procedure. You will need: the Disk Alignment Aid diskette; the Disk Alignment Tool (P/N UM 652-0158); an Allen wrench or small screwdriver (depending on the drive); and a known good Apple][and interface card.

1. Power down. Disconnect the customer's drive from his Apple.

2. Remove the cover of the customer's drive.

3. Using a known good interface card, connect the customer's drive to the DRIVE 1 position. (Make sure all the pins are in the proper holes).

4. Using a known good Apple][, make sure power is down and then insert the interface card in slot 6.

5. Boot the Disk Alignment Aid diskette and select WRT PROTECT SWITCH from the menu. When the drive starts running, remove the diskette.

6. The switch is located just inside the front left side of the housing as you face the drive door. Locate the two setscrews holding the write-protect switch in place (Figure 5, #1 & 2). The far setscrew (Figure 5, #1) forms a pivot for the switch; the near setscrew (#2) sets the switch position.

7. Holding the Disk Alignment Tool as in figure 6, insert it all the way into the drive and leave the drive door open; then turn the disk drive upside down.

8. Loosen the rear setscrew; then loosen the front setscrew and allow the switch to rise. The monitor should display the message "SWITCH ENABLED."

9. Press down on the front setscrew (#2) until the monitor displays the message "SWITCH DISABLED", and then tighten it.

10. Tighten rear setscrew (#1).

11. Turn the drive right side up and check the adjustment by withdrawing the Alignment Tool to the switch 2 position. The switch should be enabled. Push the Alignment tool all the way in (switch 1 position). The switch should be disabled.

12. Verify again, using a diskette with a write-protect tab pinched thin (this is a worst-case test).

If steps 8 and 9 do not produce the correct screen displays, replace the switch. If the problem still remains, replace the analog card.

Disk Drive Technical Procedures

Section 3

Calibration

Contents:

A. GENERAL

Before doing any of the procedures, make sure that the head carriage rails are clean. Use alcohol to clean them.

CAUTION: DO NOT LUBRICATE THE GUIDE RAILS! USE NO LUBRICANT OF ANY KIND ON THE DRIVE, NO MATTER HOW TEMPTING IT MAY BE!

The amplitude test should be done any time there are problems reading data or programs, especially those that the drive being tested has written. It checks whether the electronics are producing a large enough signal to operate reliably.

The azimuth test should be done any time a drive has problems reading data or programs, or when there is an incompatability problem between drives (i.e. one has trouble reading what the other writes). It checks whether the head is perpendicular to the track (or radial to the center of the diskette, however you want to look at it). This ensures that it will never be reading part of one bit from the left edge of the track and part of an adjacent bit from the right edge of the track.

The Carriage limiter adjustment should be done when you have trouble booting, or have a compatability problem between drives (i.e. one has trouble reading what the other writes). It sets the position of the read-write head so that it moves to the correct position whenever the drive seeks track 0. It is a rough adjustment. It should always be followed with the head radial adjustment.

The Head Radial adjustment should be done when you have trouble booting, or have a compatability problem between drives (i.e. one has trouble reading what the other writes). It should also be done after the carriage limiter adjustment is done. It fine-tunes the head position so that it will move to the exact center of each track.

The comparator offset adjustment should be done if the Analog board is replaced. It ensures that a "one" stored on the disk will be read as a one, and a "zero" as a zero.

The procedures in this section should also be performed whenever you replace the analog card or the disk mechanical assembly, or replace any component on the analog card.

If you are doing more than one test/adjustment, and you probably will be, you should do them in the order in which they appear here.

B. AMPLITUDE TEST

The amplitude test should be done any time there are problems reading data or programs, especially those that the drive being tested has written.

This test checks whether the electronics are producing a large enough signal to operate reliably.

Materials needed:

1. Apple][system with known-good disk drive and interface.
2. Disk Calibration Diskette (P/N 686-0006)
   or
   Disk Alignment Aid diskette (P/N 652-0199)
3. Scratch (expendable) diskette
4. Drive to be tested
5. Oscilloscope
6. #2 Philips screwdriver

To run the Amplitude Test:

Apple and Drive Set-up:

1. Turn the Apple]['s power off.

2. Install the known good Disk Interface card in slot 6.

3. Connect the known good drive to the Drive 1 position of the Interface card.

4. Remove the cover from the drive to be tested. Connect the drive to the Drive 2 position on the Interface card.

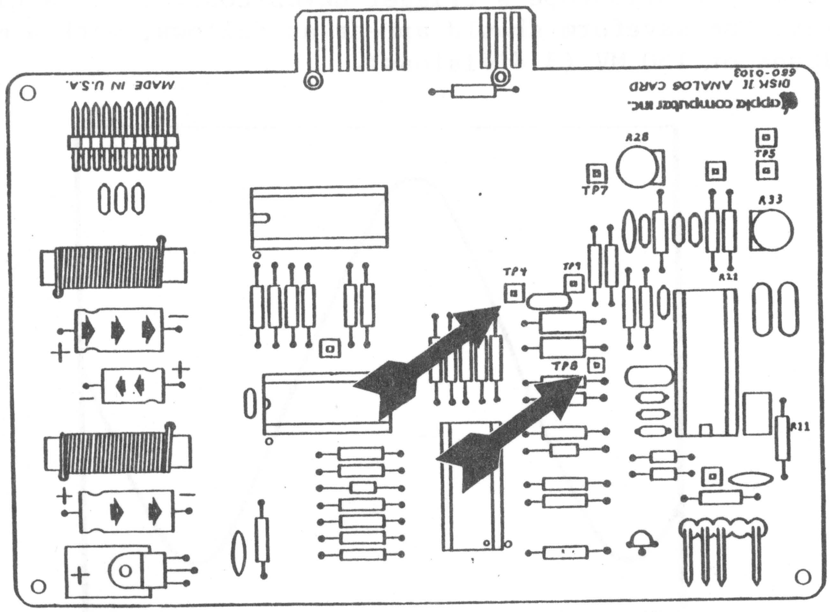
Oscilloscope Set-up:

5. Set the oscilloscope controls as follows:
   SECONDS(or TIME)/DIV = 1 uSEC/DIV
   VOLTS(or AMPLITUDE)/DIV = 50 MV/DIV (5 MV/DIV for 10X probe)
   Trigger source (INT/EXT) = INT
   Trigger slope (POS/NEG) = POS
   Input (AC/DC/GND) = AC
   Display (CH1/CH2 or A/B) = CH1 or A
   Sweep Mode (AUTO/NORM) = AUTO
   Power (ON/OFF) = ON
   INTENSITY and FOCUS for a clear sweep display

6. Connect the probe cable to the channel 1 (or A) input of the oscilloscope.

CONTINUED ON NEXT PAGE

7. Connect the probe tip to TP8 and the ground lead to TP4 on the Analog Card of the drive being tested.



The Test:

8. Boot the Calibration (or Alignment Aid) Diskette in the known good drive, then remove the diskette (let's not take any chances).

9. Put the scratch diskette in the drive being tested.

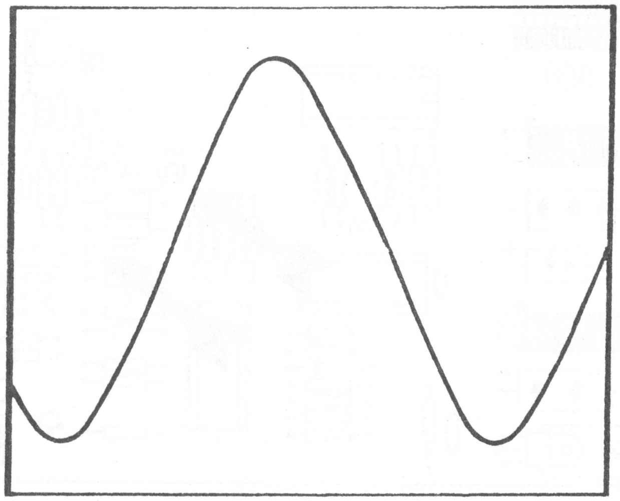
10. After the main menu appears, slowly type **ASAA** to select drive 2 as the target disk, then press <ESC>.

11. Slowly type **SSA** to select the Amplitude test.

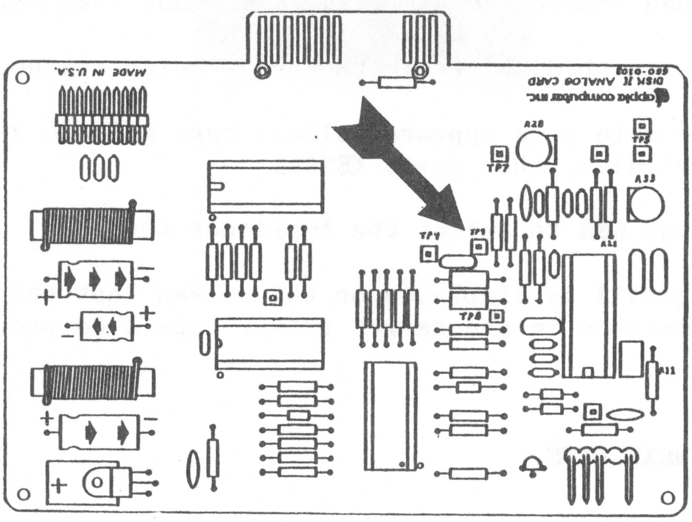
12. A warning will be displayed on the screen that the test will write on any diskette in the target drive. Type **A** to proceed with the test.

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13. After the test signal has been written to the diskette, a message will be displayed to tell you that you may proceed with the test. Adjust the oscilloscope's trigger LEVEL control for a clear, stable display. The waveform should appear as follows, with a minimum amplitude of 150 MV (3 divisions).



14. Place the probe tip on TP9. Check that the display shows the same waveform as in step 13.



15. Turn the Apple][off, then disconnect the customer's drive and (assuming that it is good at this point) re-assemble it.

This concludes the Amplitude Test.

If the amplitude is found to be unacceptable, replace the disk mechanical assembly and run the test again. If the problem persists, replace the analog card (on the customer's mechanical assembly) and run the test again.

C. AZIMUTH TEST

The azimuth test should be done any time a drive has problems reading data or programs, or when there is an incompatability problem between drives (i.e. one has trouble reading what the other writes).

This test checks whether the head is perpendicular to the track.

Materials needed:

1. Apple][system with known-good disk drive and interface.
2. Disk Calibration Diskette (P/N 686-0006)
   or
   Disk Alignment Aid diskette (P/N 652-0199)
3. Alignment diskette (P/N 090-0004)
4. Drive to be tested
5. Oscilloscope
6. #2 Philips screwdriver

To run the Azimuth Test:

Apple and Drive Set-up:

1. Turn the Apple]['s power off.

2. Install the known good Disk Interface card in slot 6.

3. Connect the known good drive to the Drive 1 position of the Interface card.

4. Remove the cover from the drive to be tested. Connect the drive to the Drive 2 position on the Interface card.

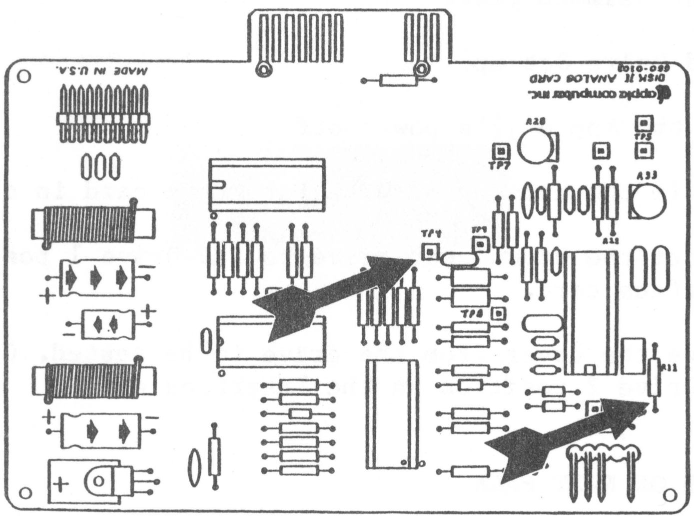
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Disk Safety Check

5. Set the oscilloscope controls as follows:
   SECONDS(or TIME)/DIV = 10 MSEC/DIV
   VOLTS(or AMPLITUDE)/DIV = 5 V/DIV (.5 V/DIV for a 10X probe)
   Trigger source (INT/EXT) = INT
   Trigger slope (POS/NEG) = POS
   Input (AC/DC/GND) = GND
   Display (CH1/CH2 or A/B) = CH1 or A
   Sweep Mode (AUTO/NORM) = AUTO
   Power (ON/OFF) = ON
   INTENSITY and FOCUS for the best trace display
   CH1 (or A, or VERT) POSITION to center the trace vertically

6. Connect the probe cable to the channel 1 (or A) input of the oscilloscope.

7. Connect the probe tip to the front end of R11 and the ground lead to TP4 on the Analog Card of the drive being tested.



8. Boot the Calibration (or Alignment Aid) Diskette in the known good drive, then remove the diskette (let's not take any chances).

9. After the main menu appears, slowly type **ASAA** to select drive 2 as the target disk, then press <ESC>.

10. Slowly type **SSSSA** to select the Seek function. The drive being tested should recalibrate and spin.

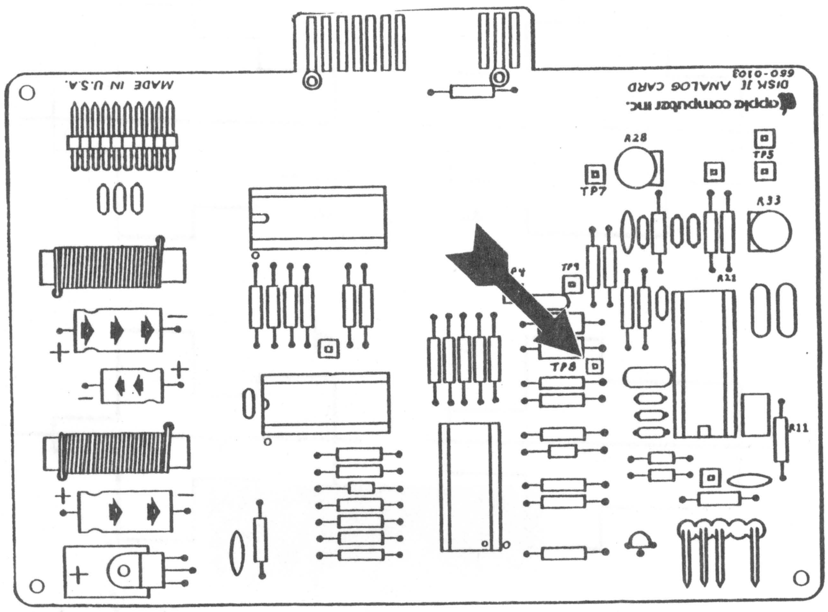
11. While watching the trace, switch the oscilloscope's input selector (AC/DC/GND) to DC. If the trace moves up or down, DO NOT CONTINUE WITH THE TEST. Replace the analog card and start again.

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The Test:

12. Change the oscilloscope controls as follows:
    SECONDS(or TIME)/DIV = .5 MSEC/DIV
    VOLTS(or AMPLITUDE)/DIV = 50 MV/DIV (5 MV/DIV for 10X probe)
    Input (AC/DC/GND) = AC
    Sweep Mode (AUTO/NORM) = NORM (the trace will disappear)

13. Connect the probe tip to TP8.

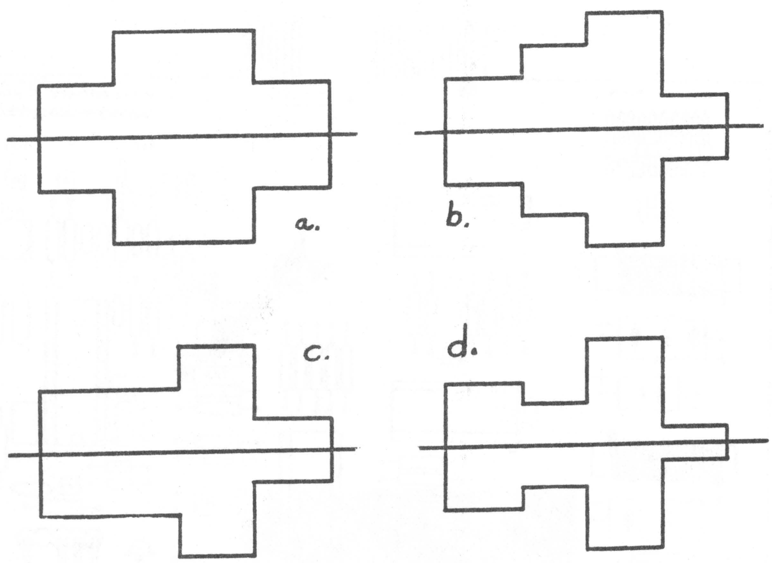


14. Put the Alignment diskette (090-0004) in the drive being tested.

15. Slowly type **SSSA34**, then press <RETURN> to move the head to track 34.

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16. Turn the oscilloscope's trigger LEVEL control all the way to the left and then back to the right until you can see the waveform clearly, then adjust the INTENSITY and FOCUS for the best display. The waveform should be a pattern of four bursts. The amplitude of the second should be equal to or greater than the amplitude of the first; the amplitude of the third should be equal to or greater than the amplitude of the fourth. Diagrams a, b, and c show acceptable patterns, diagram d shows an unacceptable one.



17. Slowly type **A1**, then press <RETURN> to move the head to track 1. The waveform should be the same as the one observed in step 16.

18. Turn the Apple][off, then disconnect the customer's drive and (assuming that it is good at this point) re-assemble it.

This concludes the Azimuth Test.

If the pattern at either or both tracks is found to be unacceptable, replace the disk mechanical assembly and run the test again. If the problem persists, replace the analog card (on the customer's mechanical assembly) and run the test again.

CAUTION: If the drive is out of adjustment, disks that it has written to may not be readable in a properly adjusted drive. Before repairing it, test the suspect disks in a known good drive and copy them if necessary (reading them in the mis-adjusted drive and writing the copies in a known good drive).

D. CARRIAGE LIMITER ADJUSTMENT

The Carriage Limiter adjustment should be done when you have trouble booting, or have a compatability problem between drives (i.e. one has trouble reading what the other writes).

This adjustment sets the position of the read-write head so that it moves to the correct position whenever the drive seeks track 0. It is a rough adjustment. It should always be followed with the head radial adjustment.

Materials needed:

1. Apple][system with known-good disk drive and interface.
2. Disk Calibration Diskette (P/N 686-0006)
   or
   Disk Alignment Aid diskette (P/N 652-0199)
3. #0 and #2 Phillips screwdrivers
4. Small flat-bladed screwdriver ("tweeker")
5. Feeler gauge (.020")
6. Drive to be adjusted

To adjust the carriage limiter

Set-up

1. Turn the Apple]['s power off.

2. Install the known good Disk Interface card in slot 6.

3. Connect the known good drive to the Drive 1 position of the Interface card.

4. Remove the cover from the drive to be tested. Connect the drive to the Drive 2 position on the Interface card.

5. Remove the screws that hold the analog card, and remove the read/write head wires from the clips on the right-side analog card supports.

6. Lean the analog card toward the back of the drive (Make sure that the head wires have enough slack to allow the carriage to move to its forward limit. To check, slide the carriage by hand to its forward limit. If the cable is too tight, adjust the position of the analog card.)

   CAUTION: MAKE SURE THAT THE ANALOG CARD ISN'T TOUCHING ANYTHING THAT MAY CAUSE AN ELECTRICAL SHORT.

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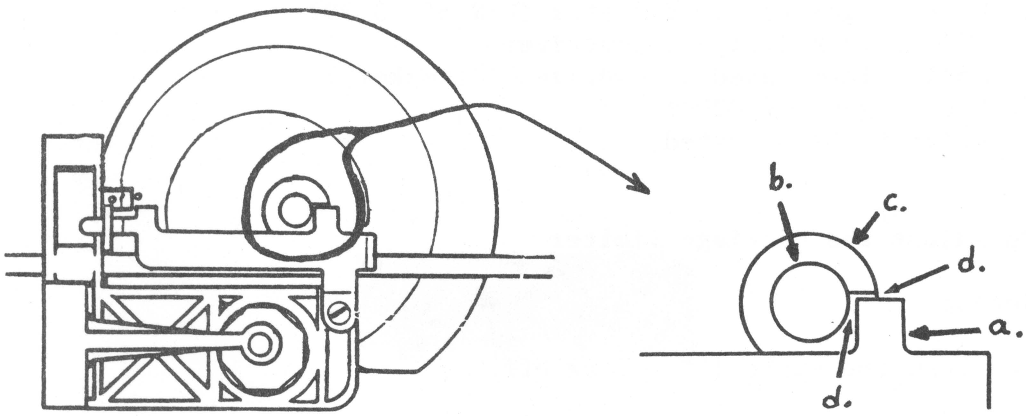
The Test:

7. Boot the Calibration (or Alignment Aid) diskette in the known-good drive.

8. After the main menu appears, set slot 6, drive 2 as the drive to be tested by slowly typing **ASAA**, then press <ESC>.

9. Slowly type **SSSSA.** The drive will recalibrate to track zero and continue to run.

10. The Carriage Limiter (a) should clear the Stepper Motor Shaft (b), and the Actuator Cam (c), by about .02" (d). Use a .020" feeler gauge to measure the clearance.

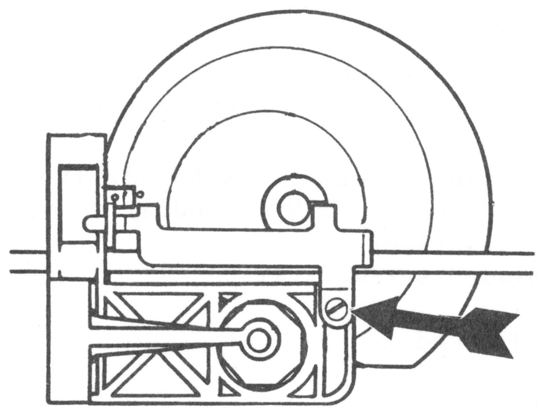


11. If adjustment is necessary, continue with this procedure. Otherwise turn the Apple][off, then disconnect and re-assemble the customer's drive.

    CAUTION: If the drive is out of adjustment, disks that it has written to may not be readable in a properly adjusted drive. Before proceeding, test the suspect disks in a known good drive and copy them if necessary (reading them in the mis-adjusted drive and writing the copies in a known good drive).

The Adjustment:

12. Loosen the adjustment screw and adjust the clearance, then re-tighten the screw.
CAUTION: The carriage limiter screw is easily stripped. Take care when tightening it.



13. Move the carriage forward by hand until you feel the cam rider drop back into the channel of the cam.

14. Type **A** to cause the drive to recalibrate again, then check that the clearance is still correct (see step 10). Re-adjust if necessary.

15. Slowly type **SSSA34** and press <RETURN>. Check to see that the head has moved forward almost to its limit but that no contact is made between the Cam Stop Extension (figure above, f) and the Stepper Motor Shaft (figure above, b).

16. Turn the Apple][off, re-install the Analog card, then turn to page 3.14 and do the Head Radial Adjustment procedure.

This concludes the Carriage Limiter adjustment.

E. HEAD RADIAL ADJUSTMENT

The Head Radial adjustment should be done when you have trouble booting, or have a compatability problem between drives (i.e. one has trouble reading what the other writes). It should also be done after the carriage limiter adjustment is done.

This adjustment fine-tunes the head position so that it will move to the exact center of each track.

Materials needed:

1. Apple][system with known-good disk drive and interface.
2. Disk Calibration Diskette (P/N 686-0006)
   or
   Disk Alignment Aid diskette (P/N 652-0199)
3. Disk Alignment diskette (P/N 090-0004)
4. #2 Phillips screwdriver
5. Medium flat-bladed screwdriver
6. Oscilloscope
7. Drive to be adjusted

To do the head radial adjustment:

Apple and Drive Set-up

1. Turn the Apple]['s power off.

2. Install the known good Disk Interface card in slot 6.

3. Connect the known good drive to the Drive 1 position of the Interface card.

4. Remove the cover from the drive to be tested.

5. Connect the drive to the Drive 2 position on the disk interface card.

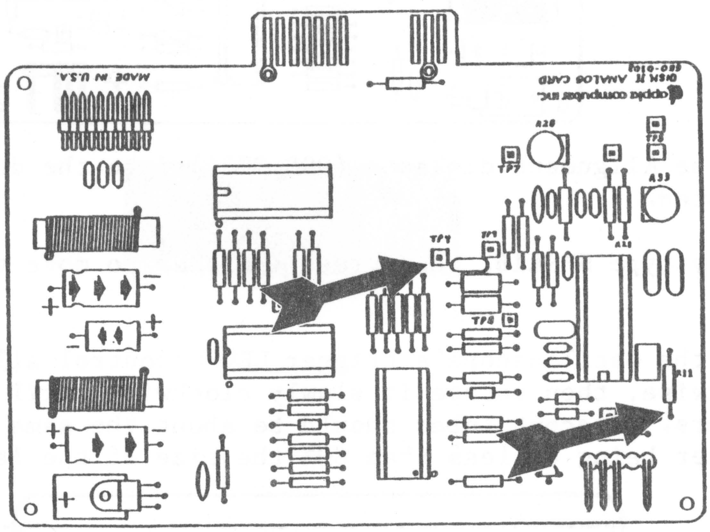
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Disk Safety Check

6. Set the oscilloscope controls as follows:
SECONDS(or TIME)/DIV = 10 MSEC/DIV
VOLTS(or AMPLITUDE)/DIV = 5 V/DIV (.5 V/DIV for a 10X probe)
Trigger source (INT/EXT) = INT
Trigger slope (POS/NEG) = POS
Input (AC/DC/GND) = GND
Display (CH1/CH2 or A/B) = CH1 or A
Sweep Mode (AUTO/NORM) = AUTO
Power (ON/OFF) = ON
INTENSITY and FOCUS for the best trace display
CH1 (or A, or VERT) POSITION to center the trace vertically

7. Connect the probe cable to the channel 1 (or A) input of the oscilloscope.

8. Connect the probe tip to the front end of R11 and the ground lead to TP4 on the Analog Card of the drive being tested.



9. Boot the Calibration (or Alignment Aid) diskette in the known-good drive, then remove the diskette.

10. After the main menu appears, slowly type **ASAA** to set slot 6, drive 2 as the drive to be tested, then press <ESC>.

11. Slowly type **SSSSA** to select the Seek function. The target disk will recalibrate and continue to run.

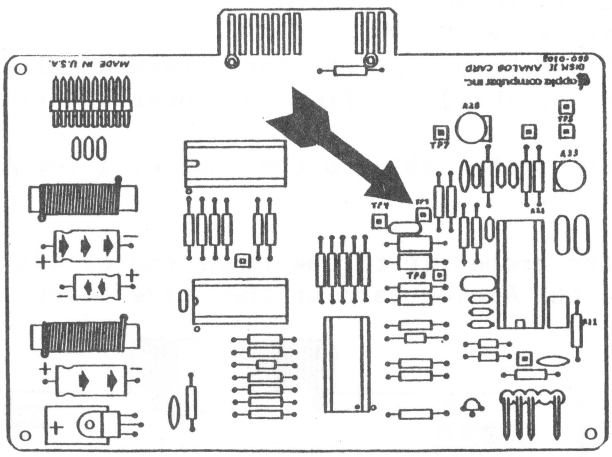
12. While watching the trace, switch the oscilloscope's input selector (AC/DC/GND) to DC. If the trace moves up or down, DO NOT CONTINUE WITH THE TEST. Replace the analog card and start again.

CONTINUED ON NEXT PAGE

The Test:

13. Change the oscilloscope controls as follows:
    SECONDS(or TIME)/DIV = 20 MSEC/DIV
    VOLTS(or AMPLITUDE)/DIV = 50 MV/DIV (5 MV/DIV for 10X probe)
    Input (AC/DC/GND) = AC
    Sweep Mode (AUTO/NORM) = NORM (the trace will disappear)

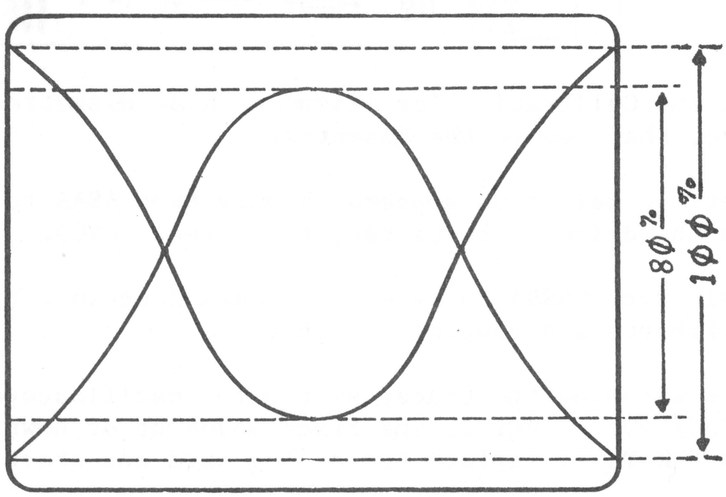
14. Connect the scope probe tip to TP9.



15. Put the Alignment diskette (090-0004) into the drive to be adjusted.

16. Slowly type **SSSA16**, then press <RETURN> to move the head to track 16.

17. Turn the oscilloscope's trigger LEVEL control all the way counter-clockwise, then rotate it slowly clockwise until a "lobe" pattern appears. Adjacent lobes should be about the same size, with the smaller being no less than 80% the size of the larger.



CONTINUED ON NEXT PAGE

18. If the drive needs adjustment, continue this procedure. Otherwise turn the Apple][off, then disconnect the customer's drive and re-assemble it.

    CAUTION: If the drive is way out of adjustment (e.g. smaller lobe only half the size of the larger lobe), disks that it has written to may not be readable in a properly adjusted drive. Before proceeding, test the suspect disks in a known good drive and copy them if necessary (reading them in the mis-adjusted drive and writing the copies in a known good drive).

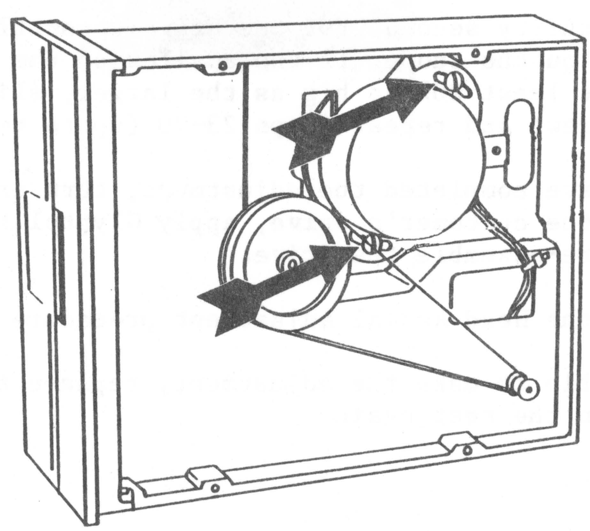
The Adjustment:

19. Free the ribbon cable from the cable clip mounted on the inside back plate of the drive.

20. Turn the drive on its side on a non-conducting surface and remove the base plate.

21. Slightly loosen the two mounting screws holding the stepper motor to the casting.

    NOTE: If the motor is very loose, the adjustment will be difficult to make.



22. Determine what type of drive you have by looking at the label on the bottom of the mechanical assembly. If the drive is labeled "APPLE COMPUTER INC.", it is an ALPS drive. If it is labeled "SHUGART ASSOCIATES", it is a SHUGART drive.

Go to the next page if you have an ALPS drive
Go to page 3.18 if you have a SHUGART drive

ALPS Drive adjustment:

23. Adjust the relative sizes of adjacent lobes by rotating the stepper motor slightly. When the lobes are as close to the same size as you can get them, hold the stepper motor in place and tighten the mounting screws.

24. Turn the drive to its normal operating position (usually bottom down).

25. Slowly type **SA** to recalibrate the drive.

26. Slowly type **SSSA16**, then press <RETURN> to move the head back to track 16.

27. Wait about thirty seconds for the drive to settle, then re-check the pattern on the scope. If the smaller of the adjacent lobes is not at least 80% as big as the larger, slightly loosen the mounting screws and repeat steps 23-27 (up to two times).

28. If the previous step was successful, slowly type **A34**, then press <RETURN> to move the head to track 34.

29. Slowly type **A16**, then press <RETURN> to move the head back to track 16 from the other direction.

30. Wait about thirty seconds for the drive to settle, then re-check the pattern on the scope. If the smaller of the adjacent lobes is not still at least 80% as big as the larger, slightly loosen the mounting screws and repeat steps 23-30 (up to two times).

31. After you have completed the adjustment, turn the Apple][off, disconnect the customer's drive, apply Glyptol to the mounting screws and re-assemble the drive.

This completes the Head Radial Adjustment procedure for ALPS drives.

If you were unable to make the adjustment, replace the mechanical assembly and run the test again.

SHUGART drive adjustment:

23. Rotate the stepper motor slowly counterclockwise until the smaller of the adjacent lobes is about half the size of the larger.

24. Rotate the motor slowly clockwise. When the smaller of the adjacent lobes is as close to 80% as big as the larger as you can get it, hold the stepper motor in place and tighten the mounting screws.

25. Turn the drive to its normal operating position (usually bottom down).

26. Slowly type **SA** to recalibrate the drive.

27. Slowly type **SSSA16**, then press <RETURN> to move the head back to track 16.

28. Wait about thirty seconds for the drive to settle, then re-check the pattern on the scope. If the smaller of the adjacent lobes isn't still at least 80% as big as the larger, loosen the mounting screws and repeat steps 24-28 (up to two times).

29. If the previous step was successful, slowly type **A34**, then press <RETURN> to move the head to track 34.

30. Slowly type **A16**, then press <RETURN> to move the head back to track 16 from the other direction.

31. Wait about thirty seconds for the drive to settle, then re-check the lobe pattern on the scope. If the smaller of the adjacent lobes isn't still at least 80% as big as the larger, loosen the mounting screws and repeat steps 24-31 (up to two times).

32. After you have completed the adjustment, turn the Apple][off, disconnect the customer's drive, apply Glyptol to the mounting screws and reassemble the drive.

This completes the Head Radial Adjustment procedure for SHUGART drives.

If you were unable to make the adjustment, replace the mechanical assembly and run the test again.

F. COMPARATOR OFFSET ADJUSTMENT:

The comparator offset adjustment should be done if the Analog board is replaced.

It ensures that a "one" stored on the disk will be read as a one, and a "zero" as a zero.

Materials needed:

1. Apple][system with known-good disk drive and interface.
2. Disk Calibration Diskette (P/N 686-0006)
   or
   Disk Alignment Aid diskette (P/N 652-0199)
3. Scratch (expendable) diskette
4. Drive to be tested
5. Oscilloscope
6. #2 Philips screwdriver

To run the Amplitude Test:

Apple and Drive Set-up:

1. Turn the Apple]['s power off.

2. Install the known good Disk Interface card in slot 6.

3. Connect the known good drive to the Drive 1 position of the Interface card.

4. Remove the cover from the drive to be tested. Connect the drive to the Drive 2 position on the Interface card.

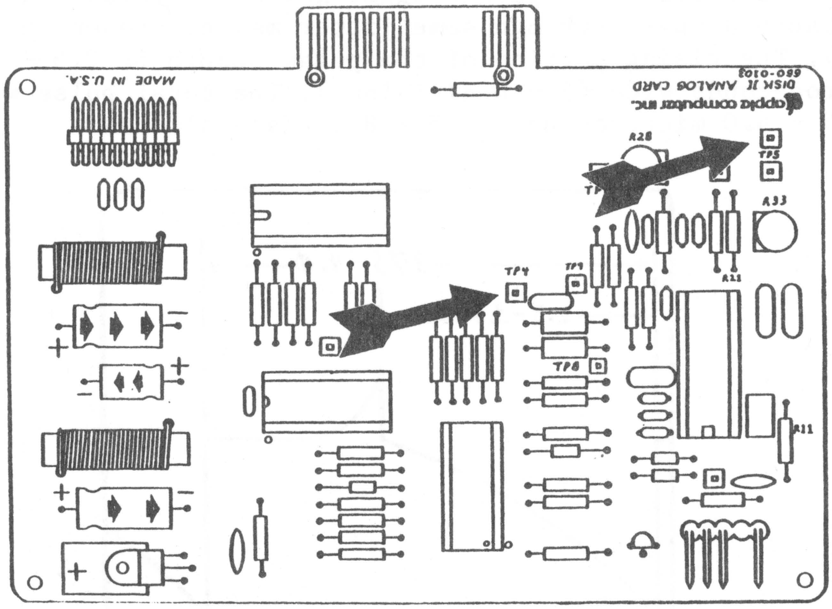
Oscilloscope Set-up:

5. Set the oscilloscope controls as follows:
   SECONDS(or TIME)/DIV = .5 uSEC/DIV
   VOLTS(or AMPLITUDE)/DIV = 1 V/DIV (.1 V/DIV for 10X probe)
   Trigger source (INT/EXT) = INT
   Trigger slope (POS/NEG) = NEG
   Input (AC/DC/GND) = AC
   Display (CH1/CH2 or A/B) = CH1 or A
   Sweep Mode (AUTO/NORM) = AUTO
   Power (ON/OFF) = ON
   INTENSITY and FOCUS for a clear sweep display

6. Connect the probe cable to the channel 1 (or A) input of the oscilloscope.

CONTINUED ON NEXT PAGE

7. Connect the probe tip to TP5 and the ground lead to TP4 on the Analog Card of the drive being tested.



The Test:

8. Boot the Calibration (or Alignment Aid) Diskette in the known good drive, then remove the diskette.

9. Put the scratch diskette in the drive being tested.

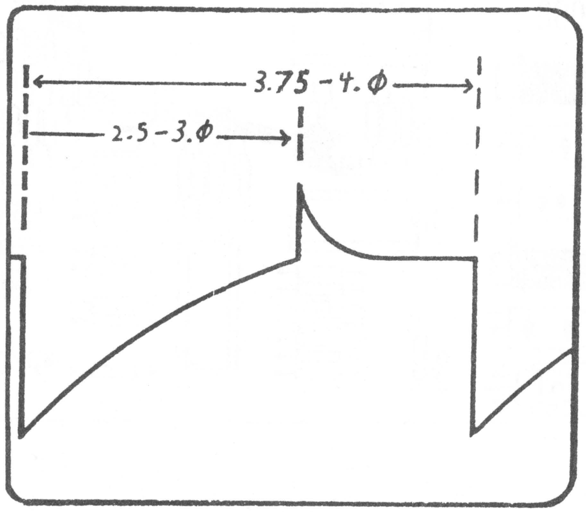
10. After the main menu appears, slowly type **ASAA** to select drive 2 as the target disk, then press <ESC>.

11. Slowly type **SSA** to select the Amplitude test.

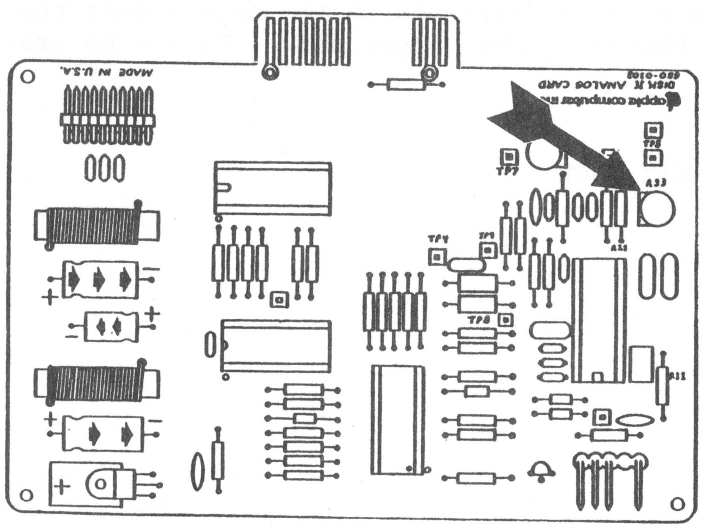
12. A warning will be displayed on the screen that the test will write on any diskette in the target drive. Type **A** to proceed with the test.

CONTINUED ON NEXT PAGE

13. After the test signal has been written to the diskette, a message will be displayed to tell you that you may proceed with the test. Adjust the oscilloscope's trigger LEVEL and INTENSITY controls for a stable display (though some jitter may be present near the right end). The rising portion of the pulse should be 2.5 - 3.0 microseconds wide (5 - 6 divisions). The total pulse width will be 3.75 - 4.0 microseconds (7.5 - 8 divisions).



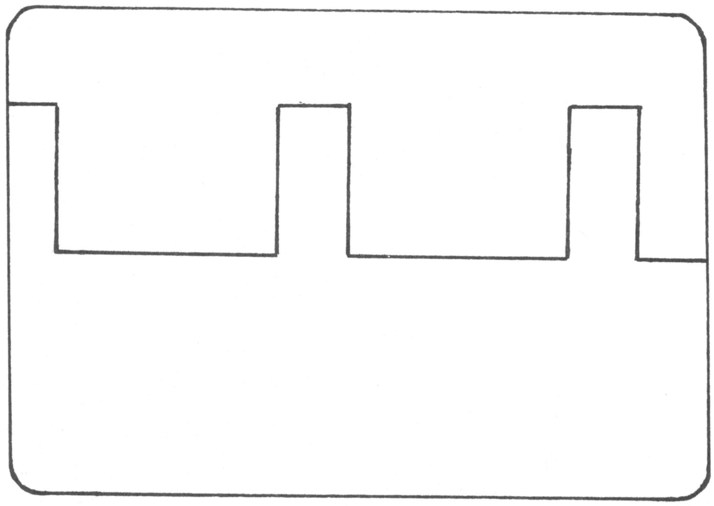
14. If necessary, adjust potentiometer R21 or R33 until the central peak is in the correct position.
NOTE: On most Analog boards, R21 is a fixed resistor and R33 is the adjustment. On some, R21 is a potentiometer and should be used for the adjustment. On other boards, neither potentiometer is present. In this last case, the board must be replaced if adjustment is indicated.



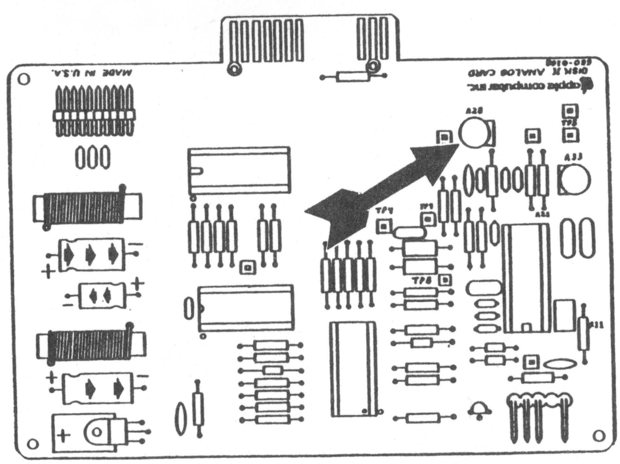
CONTINUED ON NEXT PAGE

15. Change the oscilloscope's sweep speed to 1 uSEC/DIV.

16. Move the scope probe tip to TP7. Adjust the trigger LEVEL control to get a clear display. The pulses at this point should have no dual images on the rising and falling edges (though a certain amount of jitter will be present).



16. If necessary, adjust potentiometer R28 on the analog card until there is a single, stable image with a minimum of jitter.



17. After you have made the adjustments, turn the Apple][off. Then disconnect the customer's drive, apply Glyptol to the potentiometers, and re-assemble the drive.

This completes the Comparator Offset adjustment procedure.

If you were unable to make the adjustments, replace the Analog board and run the test again.

Disk][Technical Procedures

Section 4

Troubleshooting

Contents:

Disk][Troubleshooting Chart

Symptom	Probable Cause
Disk][will not boot; drive comes on. System gives I/O errors during normal operation.	1) Dspeed 2) Head Dirty 3) Interface Cable 4) Disk Analog card 5) Disk Mechanical
Disk][will not boot; drive does not come on.	1) Interface Cable 2) Disk Mechanical 3) Disk Analog card
Disk][makes high pitched whining sound.	1) Disk Mechanical
Disk][writes when diskette is protected.	1) Write Protect switch alignment 2) Disk Analog card
Disk][reads but does not write.	1) Disk Analog card

Disk][Technical Procedures

Section 5

Analog Card Procedures

Contents:

Introduction

This document contains Level 1 repair procedures for the disk][analog card. The disk][analog card is used in the Disk][drive which is used by the Apple][,][+ and //e computers. In order to thoroughly test the analog card, follow **ALL** of the procedures in this section. Doing this will insure that no potential problems are overlooked.

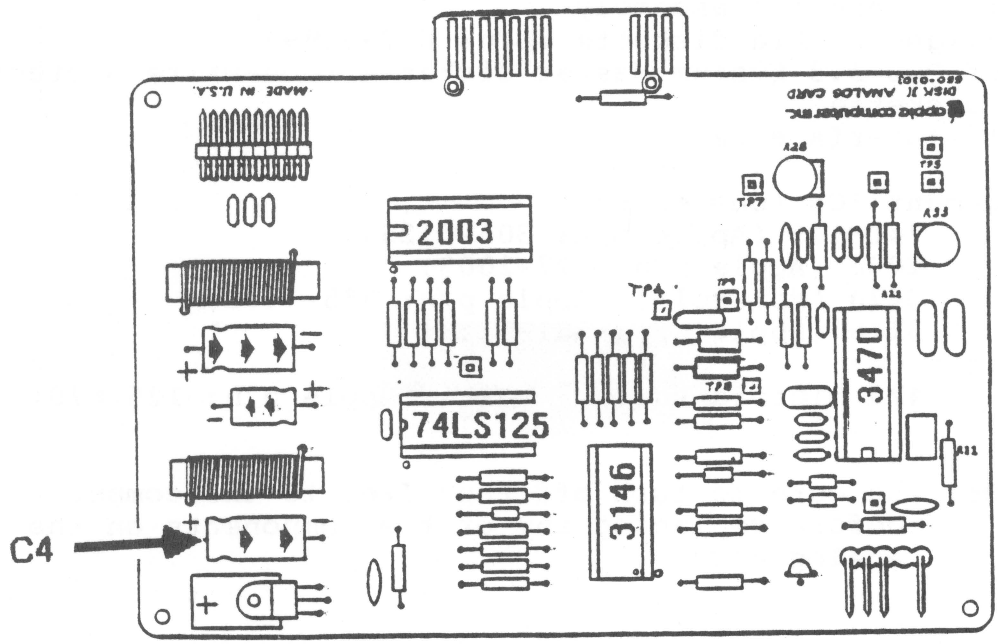
Materials Required

Apple //e Computer
Disk][(complete) with disk controller
Disk][mechanical assembly
Disk Alignment Aid diskette (p/n: 652-0199)
Copy of DOS 3.3 System Master diskette (non-write protected)
Blank diskette
Disk][Interface cable

Replacement ICs (one each):
- 74LS125 (Apple p/n: 305-0125)
- 2003 (Apple p/n: 327-2003)
- 3470 (Motorola) (Apple p/n: 355-3470)
- 3146 (Apple p/n: 351-3146)

Capacitor C4:
- 470 microfarad, 6.3 volts (Apple p/n: 125-6701)

CAUTION: Be sure to turn off the power to the computer before replacing any of the components on the analog card.


2003
74LS125
3146
3470
C4
TP4
MADE IN U.S.A.

System Setup

For the analog card to be correctly diagnosed, it must be the only unknown variable in the test system. Using all known-good, verified components, assemble them as follows:

1. Place the analog card to be tested on the DRIVE 2 mechanical assembly and connect all cables.

2. Place the disk controller card in slot 6 of the Apple //e.

Visual Inspection

Examine the suspect analog card for visual signs of damage. This may take one of several forms:

1. Burned or melted ICs or sockets. Remove each of the four ICs and closely examine them and the sockets. Replace all damaged ICs with good ones. Return all analog cards with damaged sockets to Apple.

2. Capacitor C4 (large capacitor at corner of card) may be visibly damaged (burned, exploded, melted). Observing correct polarity (match the + of the capacitor to the + on the analog card), replace C4 if it is damaged. If C4 is damaged, the 74LS125 is also damaged and should be replaced.

3. Components other than the four ICs and capacitor C4 may be physically damaged and in need of replacement. These cards should be returned to Apple for repair.

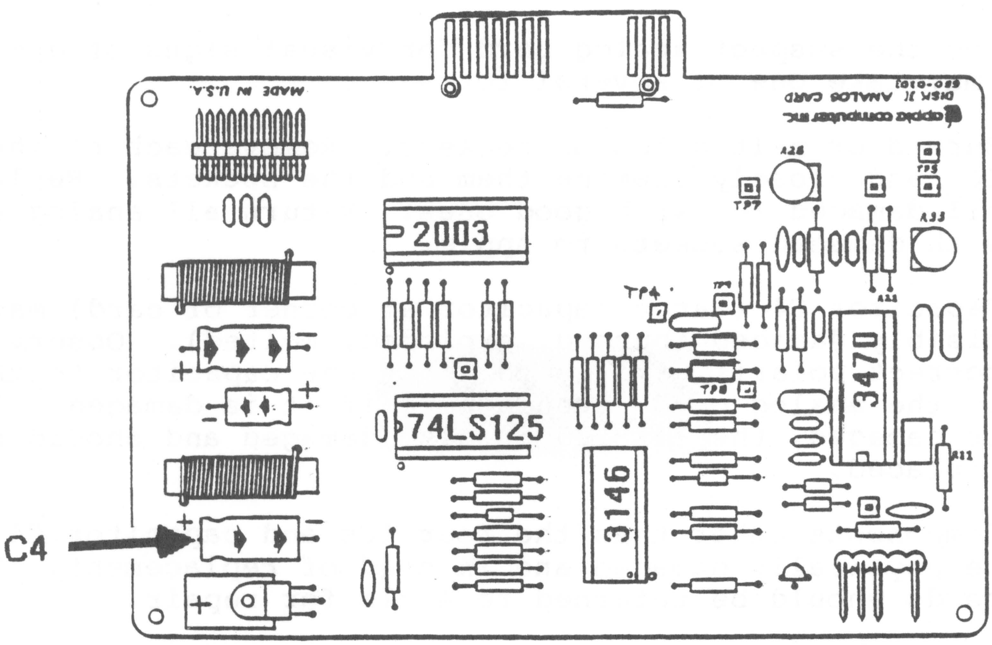
WARNING: Do not use an eraser to clean gold contacts. Use only a liquid or spray contact cleaner and a clean cloth.

Troubleshooting

A malfunctioning analog card may manifest symptoms in one of five ways:

- Drive 1 will not boot (with bad drive 2 analog card connected).
- Drive will not read or write (could destroy data).
- Drive has trouble reading.
- Drive has trouble writing.
- Write protect switch circuit malfunctions.

A troubleshooting procedure for each failure mode follows.


C4
2003
74LS125
3146
3470
TP4

Drive 1 Will Not Boot

It is possible that an analog card can be damaged in such a way that when it is mounted on drive 2, it keeps drive 1 from booting normally. To test for this condition:

1. Mount the analog card to be tested on the drive 2 mechanical assembly and connect the cables from the mechanical assembly, the read/write head, and the disk controller.

2. Place the DOS 3.3 System Master diskette in drive 1 and a good blank diskette in drive 2.

3. Turn on the power to the Apple //e. The DOS diskette should boot and display a prompt (]) on the screen. If the diskette does not boot, turn off the power to the computer and replace the following devices, one at a time, repeating this step after each until the diskette boots.

    - IC at D4 (labelled 2003)
    - IC at B4 (labelled 74LS125)
    - IC at A3 (labelled CA3146)
    - IC at B1 (labelled 3470)

If the DOS diskette still fails to boot, place all original ICs in their sockets and return the analog card to Apple.

Drive Will Not Read or Write

If the DOS 3.3 System Master diskette boots successfully in drive 1, perform the following steps:

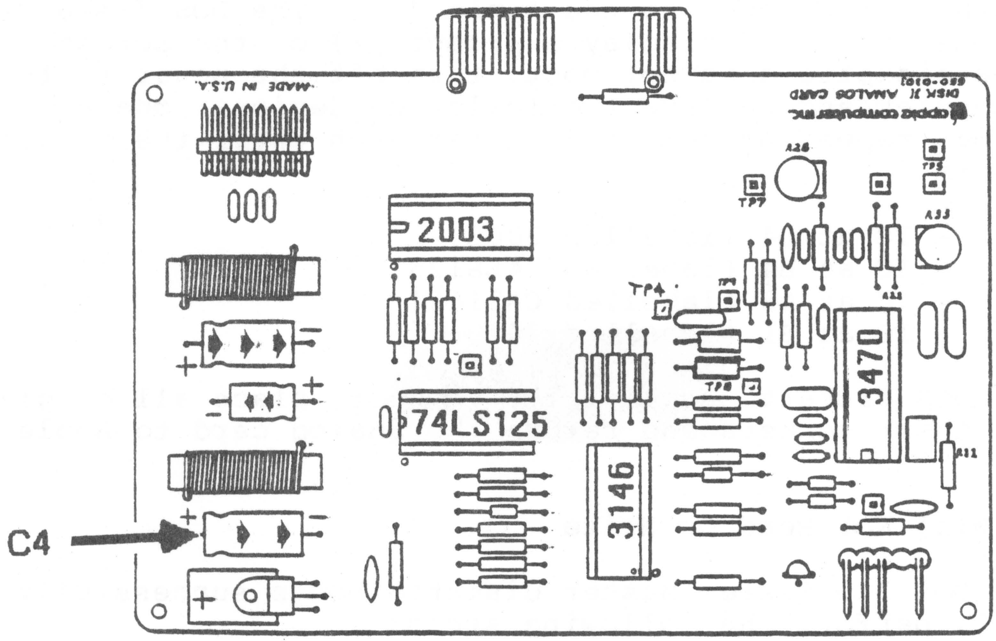
1. Turn off the power to the computer, remove the System Master diskette from the drive 1 and insert the Disk Alignment Aid diskette in drive 1. Turn the power on. The video screen displays the main menu, with **SET TARGET DISK** selection highlighted.

2. Press the **A** key. The video screen will display the **SET TARGET DISK** menu.

3. Press the **S** key to highlight the **SET DRIVE** selection.

4. Press the **A** key to select **SET DRIVE** option.

5. Press the **A** key to accept drive 2 as the target drive.



C4
2003
74LS125
3146
3470
TP4
MADE IN U.S.A.

6. Press the **ESCAPE** key to return to the main menu.

7. Press the **S** key until **DSPEED** is highlighted.

8. Insert a blank diskette without a write-protect tab in drive 2. Press the **A** key to accept the **DSPEED** test.

9. Press the **A** key to begin the DSPEED test. The video screen will display a scale with the high, low and current disk speed values. Locate the speed adjustment screw on the motor control PCB under the right front of the mechanical assembly. Adjust this pot while observing the current speed value and indicator (arrow). If the value changes and the arrow moves as you turn the adjustment, this portion of the circuit is functional; proceed to the **Drive Has Trouble Reading** procedure. If the drive speed indicator does not move to reflect the speed adjustment, this circuit is faulty; turn off the power to the computer and replace the following devices (except those which have been replaced previously), one at a time, repeating this test after each device until the indicator moves reflecting the speed changes:

    - IC at B1 (labelled 3470)
    - IC at A3 (labelled 3146)
    - IC at B4 (labelled 74LS125)
    - IC at D4 (labelled 2003)

If you replace all of the ICs on the analog card and the DSPEED indicator still fails to move, perform the **COMPARATOR OFFSET ADJUSTMENT** located in the calibration procedures of the Disk][Technical Procedures section. If the analog card still fails to function properly, place all original ICs in their sockets and return the card to Apple.

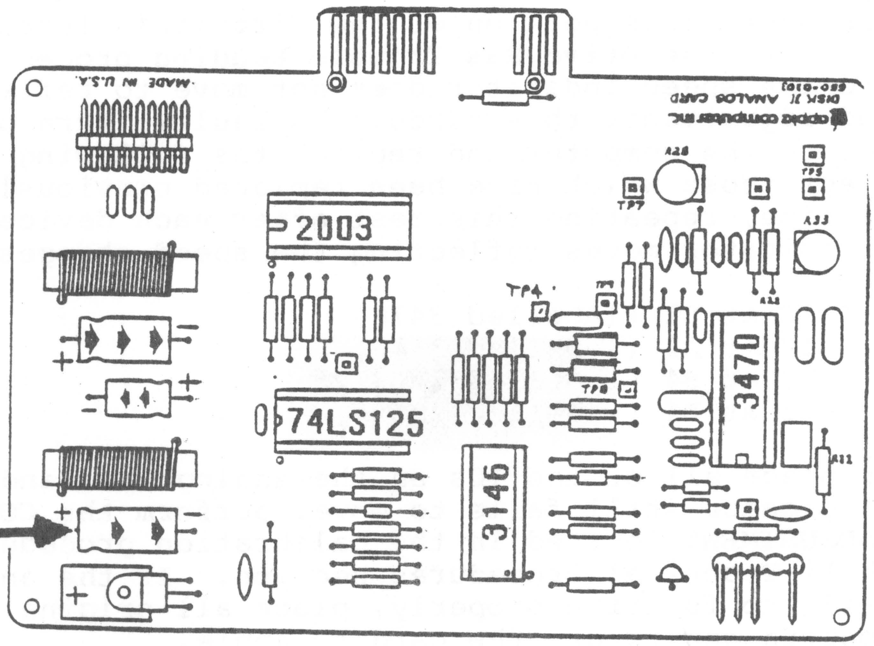
Drive Has Trouble Reading

If the drive will perform the DSPEED test successfully, perform the following steps:

1. Boot the DOS 3.3 System Master in drive 1, then remove it and place it in drive 2.

2. Type **CATALOG,D2** and press <RETURN> and watch drive 2 closely for activity. The video screen should display the catalog of the DOS 3.3 System Master diskette. If this does not occur, replace the following devices according to the observed symptoms:

C4



SYMPTOM	IC	LOCATION
Head does not move	2003	D4
Disk does not turn	2003	D4
Recalibrates repeatedly	3470	B1
I/O ERROR	3470	B1
" "	3146	A3
" "	74LS125	B4
" "	2003	D4

If you have replaced all of the ICs on the analog card and the catalog still does not display, perform the **COMPARATOR OFFSET ADJUSTMENT** located in the calibration procedures of the Disk][Technical Procedures section. If the analog card still fails to function properly, place all original ICs in their sockets and return the card to Apple.

Drive Has Trouble Writing

If the analog card correctly displays the catalog of drive 2, perform the following steps:

1. Boot the DOS 3.3 System Master diskette in drive 1, and then move it to drive 2.

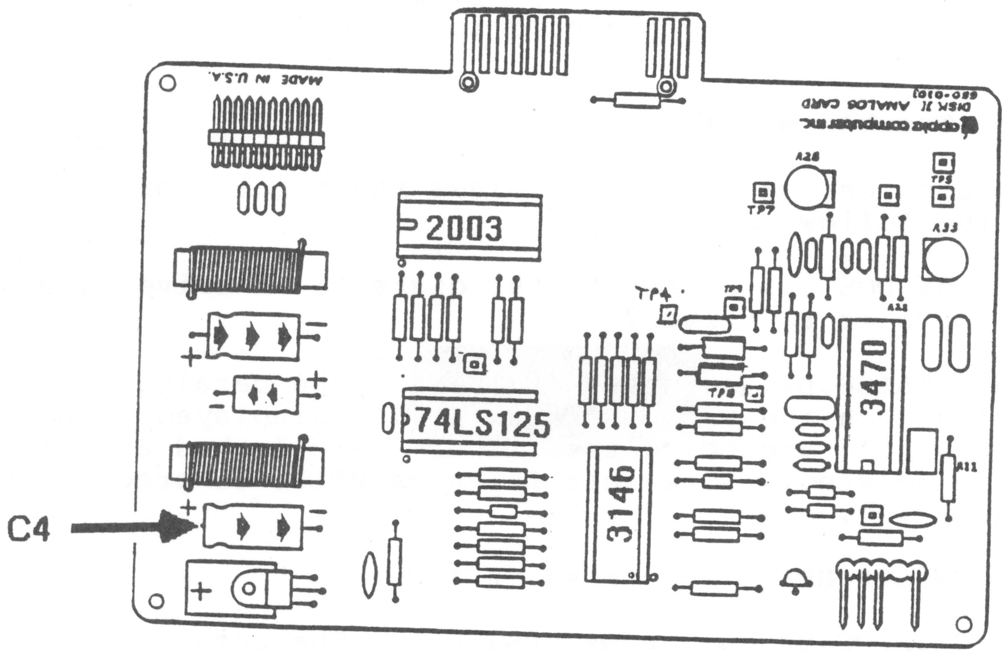
2. Type **CATALOG,D2** and press <RETURN>. The catalog will be displayed on the video screen. Files displayed with an asterisk (*) preceding the filename are locked and may not be deleted. Note that filename HELLO is preceded by an asterisk.

3. Type **UNLOCK HELLO** and press <RETURN>.

4. Type **CATALOG,D2** and press <RETURN>. The catalog will be displayed on the video screen. Verify that filename HELLO is <u>not</u> preceeded by an asterisk. If you encounter trouble when attempting to unlock the file, turn off the power to the computer and replace the following devices (except those which have been replaced previously), one at a time, repeating this test after each device until the UNLOCK command executes successfully:

   - IC at B4 (labelled 74LS125)
   - IC at D4 (labelled 2003)
   - IC at A3 (labelled 3146)

apple computer



5. Type **LOCK HELLO** and press <RETURN> to re-lock the file.

If you have replaced all of the ICs on the analog card and the file still does not unlock, perform the **COMPARATOR OFFSET ADJUSTMENT** located in the calibration procedures of the Disk][Technical Procedures section. If the analog card still fails to function properly, place all original ICs in their sockets and return the card to Apple. Otherwise, go on to the next procedure.

Write-Protect Switch Circuit Malfunctions

1. Place a write-protect tab on the DOS 3.3 System Master diskette and insert the diskette in drive 2.

2. Repeat steps 2 and 3 above (**DRIVE HAS TROUBLE WRITING**). The video screen should display **WRITE PROTECT ERROR.** If this does not occur, replace the following device (unless it has been replaced previously), and repeat this test.

    - IC at B4 (labelled 74LS125)

If the screen still does not display **WRITE PROTECT ERROR,** place all original ICs in their sockets and return the analog card to Apple.

Disk II Technical Procedures

Section 6

Illustrated Parts List

The figures and lists below include all piece parts that can be purchased separately from Apple for the Disk II, along with their part numbers. These are the only parts available from Apple. Refer to your Apple Service Programs manual for prices.

Contents:

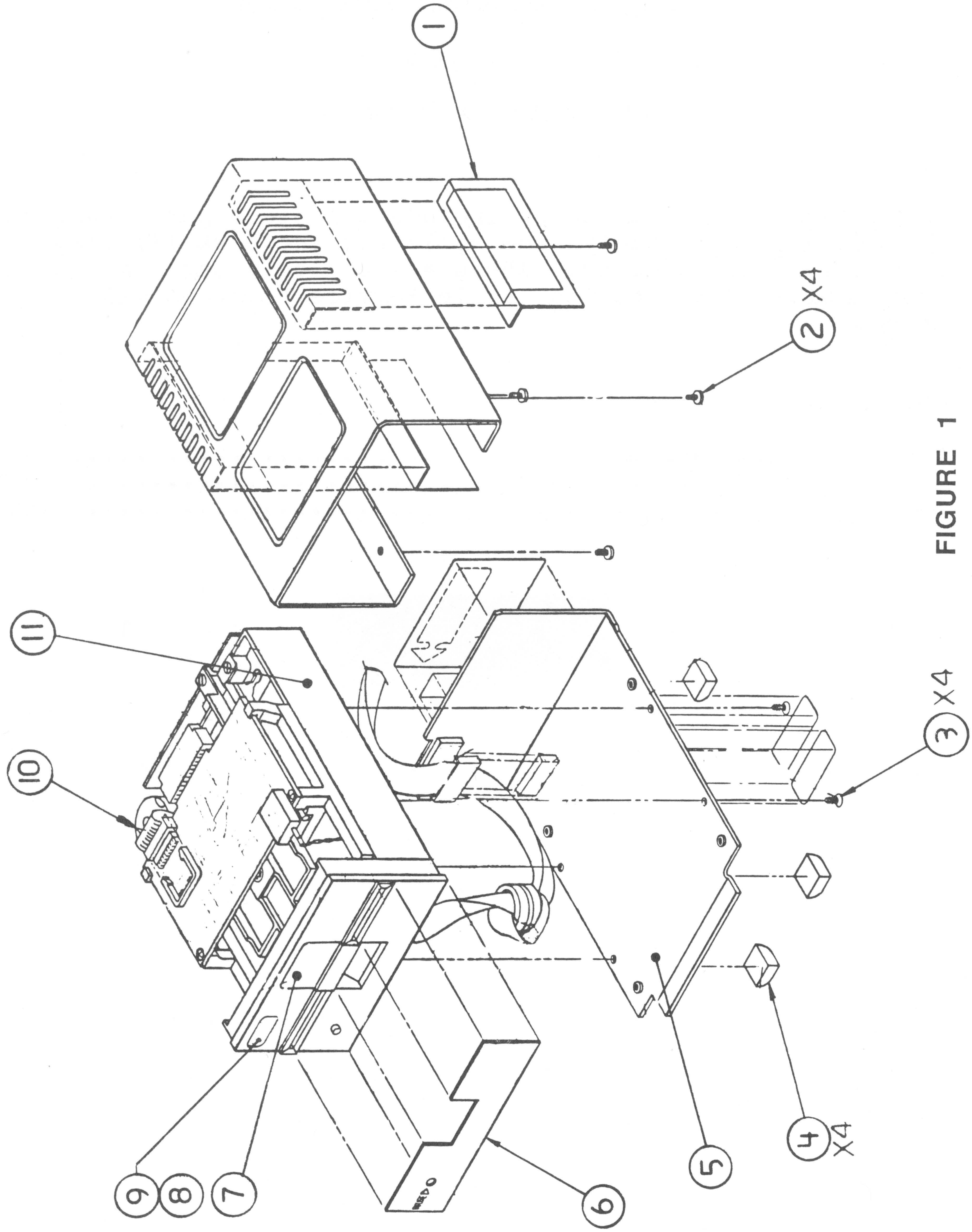


FIGURE 1

DISK II - FINISHED GOODS ASSEMBLY (Figure 1)

Item	Part No.	Description
1	825-0009	Cover, Case Slots, Disk II
2	403-1606	Screw, 6-32 x 3/8, DRPHD, Disk II
3	400-3604	Screw, 6-32 x 1/4, Pozi-Drive FLT Hd, Disk II
4	865-0001	Rubber Feet
5	805-0005	Chassis Base, Disk II
6	825-0005	Disk II Front Name Plate Label
7	U815-0066	Door & Hinge Assembly
8	825-0011	Multiple Drive ID #1, Label
9	825-0012	Multiple Drive ID #2, Label
10	590-0031	Disk II Cable Assembly, 15" LG
11	661-92012	Disk II Mechanical Assembly

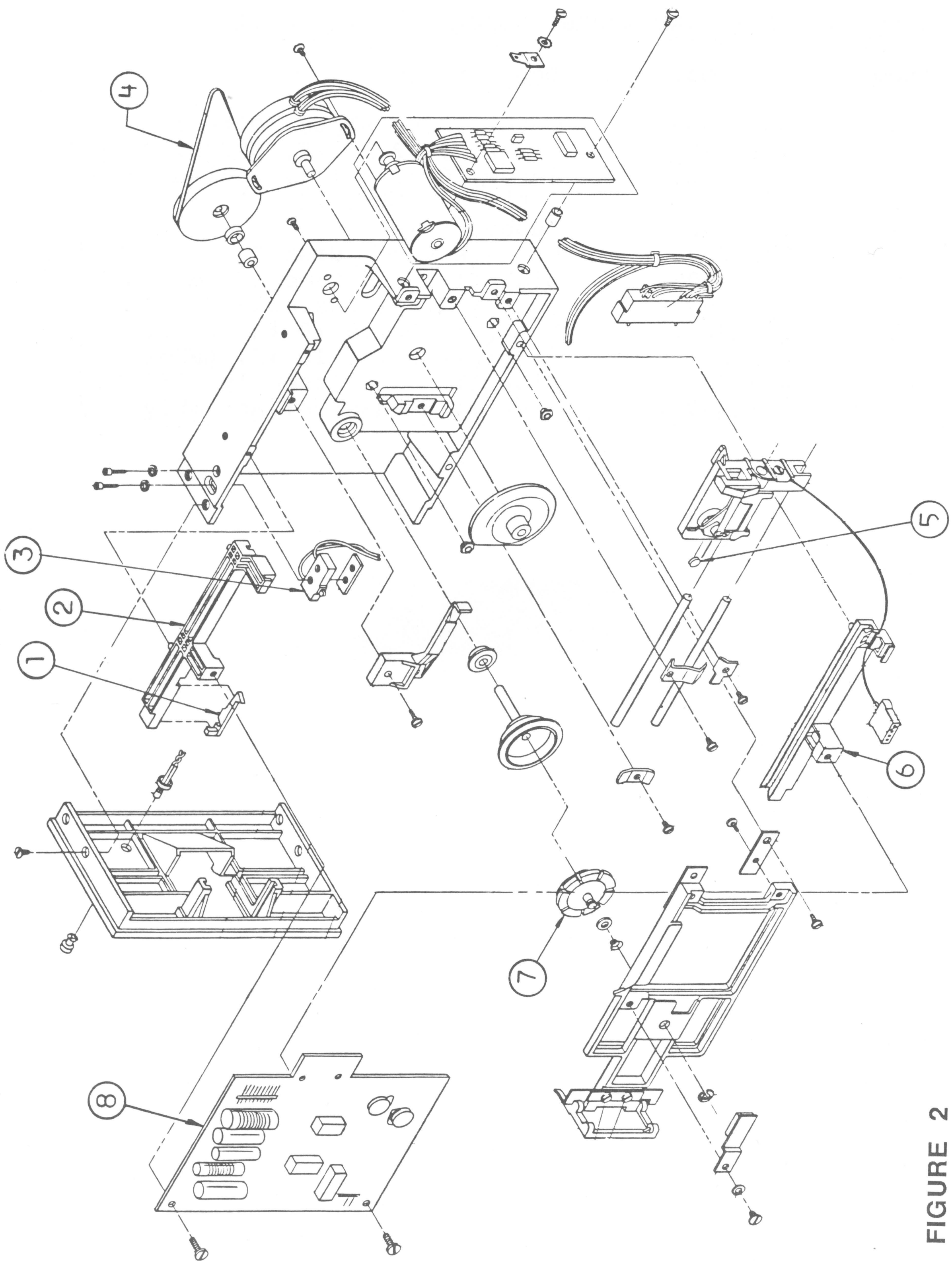


FIGURE 2

DISK II - INTERNAL PARTS (Figure 2)

Item	Part No.	Description
1	815-0377	Write Protect Actuator (Alps)
	U815-0073	Write Protect Actuator (Shugart)
2	815-0081	Guide, Diskette (WRT-PRT) (Alps)
	U815-0072	Guide, Diskette (WRT-PRT) (Shugart)
3	U705-0005	Write Protect Switch DII-///
4	U880-0002	Disk Drive Belt
5	U815-0064	Load Button
6	815-0080	Guide, Diskette (Cable)
7	U815-0067	Collet Hub
8	661-92001	Disk II Analog Card

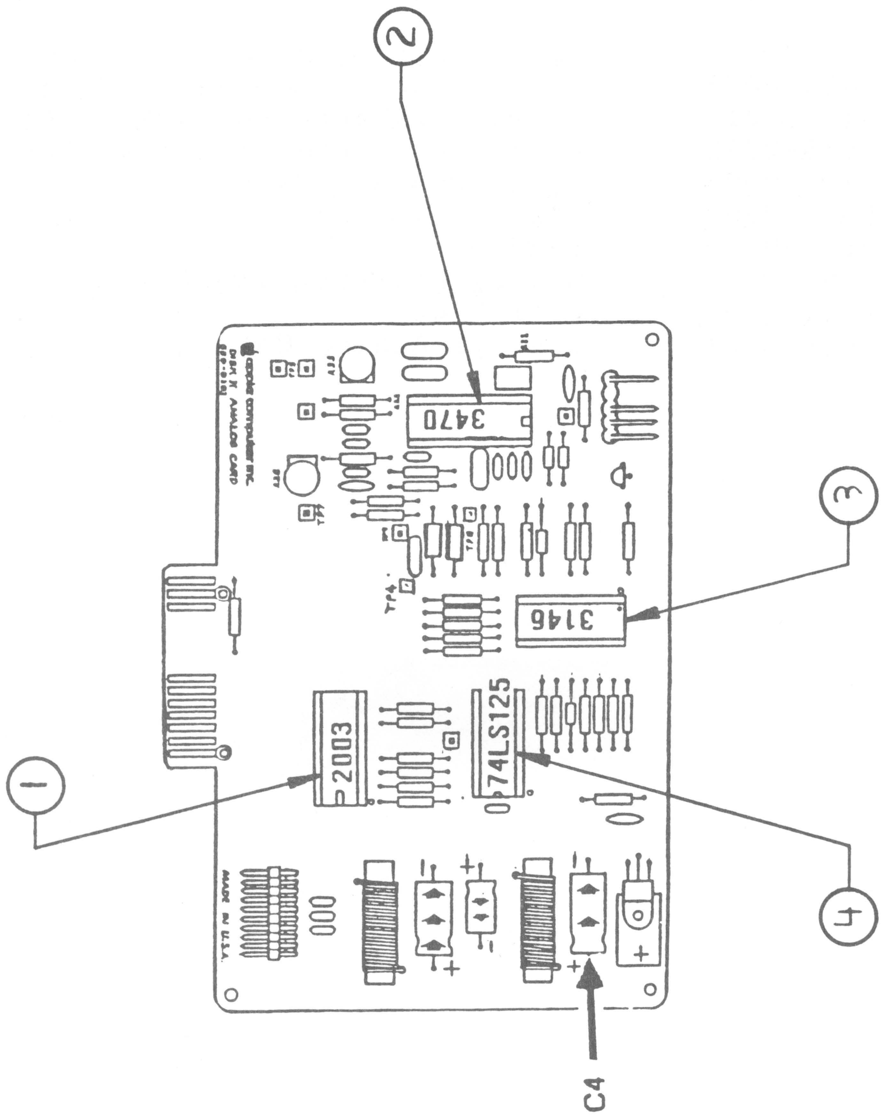


FIGURE 3

DISK II - ICs (Figure 3)

Item	Part No.	Description
1	327-2003	IC2003A
2	355-3470	IC MC3470
3	352-3146	IC 3146
4	306-0125	IC 74LS125

Disk ///

apple computer

DISK /// TECHNICAL PROCEDURES

TABLE OF CONTENTS

Section 1. External Disk Drive /// Take-apart and Adjustments

Section 2. Analog Card Repair

Section 3. Illustrated Parts List

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TECHNICAL PROCEDURES

EXTERNAL DISK DRIVE ///

TAKE-APART AND ADJUSTMENTS

Contents

A. INTRODUCTION

When data cannot be written to or read from a diskette in the external drive, it may mean that the drive needs adjustment. This module describes how to disassemble and adjust the drive and gives you the opportunity to practice the procedures involved. At the end of the job aid is a Disassembly/Assemblly Checklist for the external Disk Drive /// (Disk ///).

The Disk /// is disassembled in three phases: first the cover, then the metal shield and ribbon cable, and finally the analog card. Assembly is just the reverse. After you disassemble the Disk ///, you will adjust or replace several parts, including Guide, Collet Hub, Head Load Button, the D-Speed and Write Protect switch. These procedures are the same as for the Disk][.

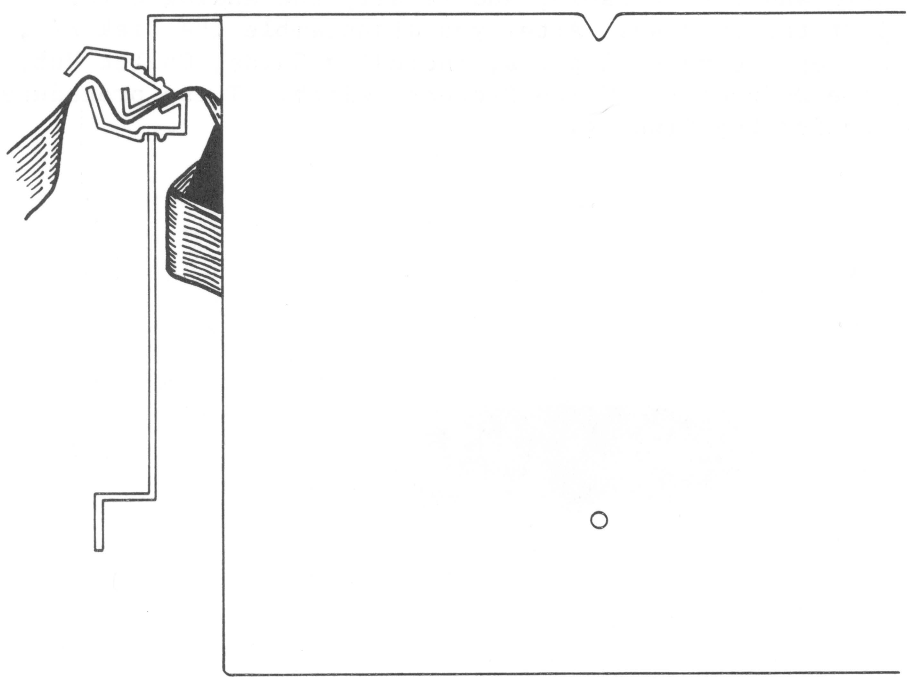


FIGURE 1

B. REMOVING THE COVER

1. Turn the power off on the Apple ///.

2. Unplug the external disk drive from the rear connector of the Apple ///. Be sure to check if there are any screws securing the connector before pulling on it. Pull by the connector rather than by the cable.

3. Unplug any other daisy-chained drives from the rear panel of the drive to be disassembled.

4. Close the disk door on front of disk drive unit.

5. Turn the drive over with the bottom-side up and remove the four Phillips screws.

6. Lift the bottom cover up from the rear and remove it. Turn the unit top side up.

7. Remove the single Phillips screw from the back panel.

8. Holding on the bottom front of the top cover, pull the cover slightly forward and up until it clears the interior parts of the drive. Set cover aside.

C. REMOVING THE RIBBON CABLE

9. Remove the four Phillips screws holding the metal shield to the drive chassis.

10. Remove the flat cable from the back of the drive by pressing the strain relief (Figure 1) out of the slot and removing the cable. Slip a screwdriver inside the metal shield and pry down on the strain relief while simultaneously pulling down and out from outside. Be sure not to crush the cable when prying the strain relief. (Large pliers can be used to compress the strain relief enough to separate it from the mounting bracket.) The relief will come apart in two pieces. The strain relief can be a real bear, so be persistent!

11. Slide the metal shield cover back and off the drive, being careful not to pull on the cable as it is still connected to the analog card.

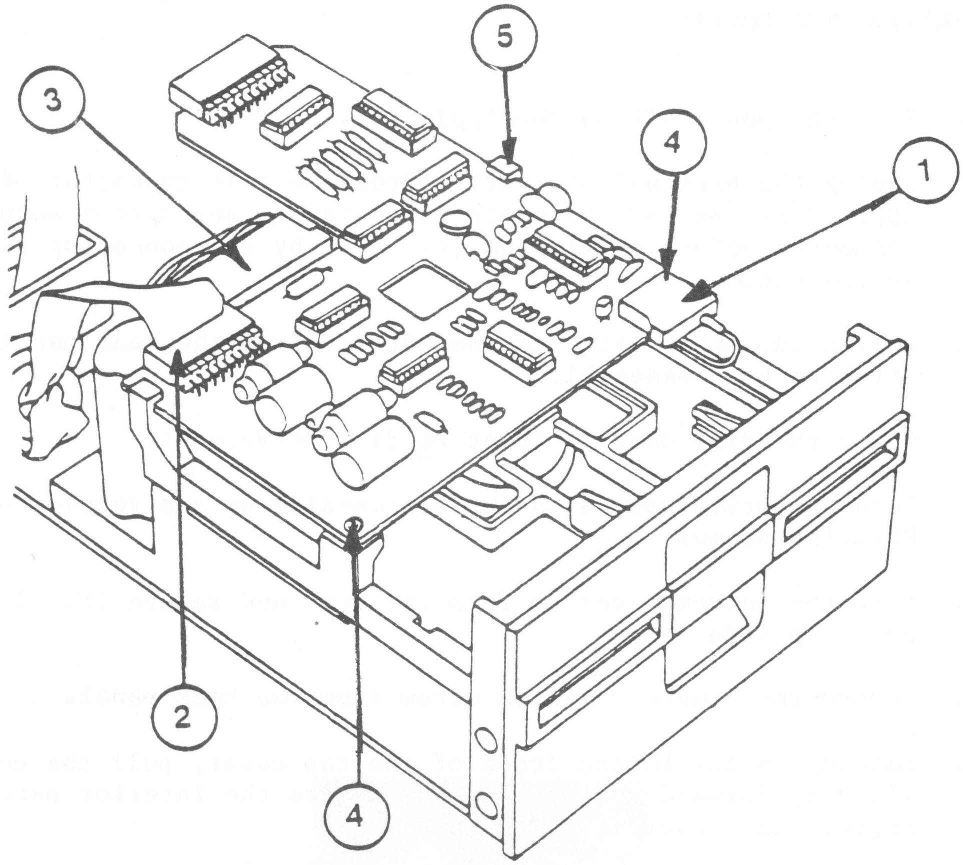


FIGURE 2

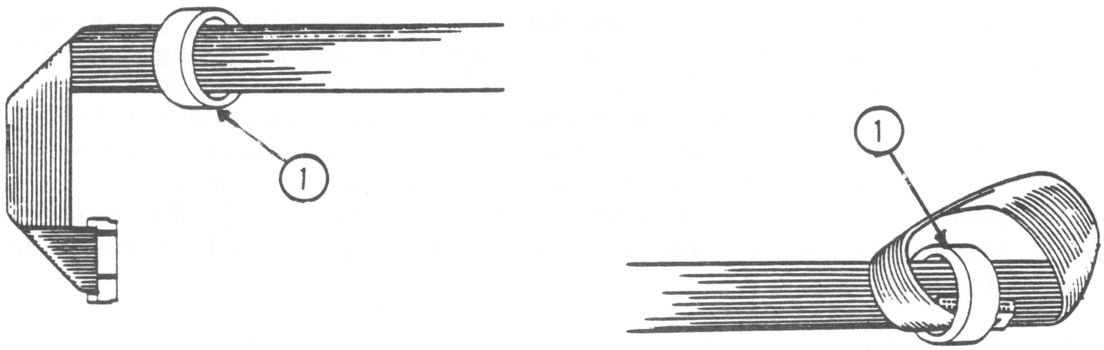


FIGURE 3

12. Lift up on the connector retainer of the board plug (Figure 2,#3) and remove the plug.

13. Remove the ribbon cable connector from the analog card (Figure 2,#2). It might be fastened very securely, so grasp the connector and pull back firmly until it disconnects. It may help to wiggle it gently back and forth as you pull back, but be careful not to bend the connector pins.

14. When replacing the ribbon cable, twist the cable connector slightly, push it through the toroids and remove the toroids from the cable (Figure 3,#1).

D. REMOVING THE ANALOG CARD

15. Remove head molex plug from front of analog card (Figure 2,#1).

16. Remove the two screws at the front of the analog card (Figure 2,#4).

17. Slide analog card forward past the retaining slots at the rear and then lift out (Figure 2,#5).

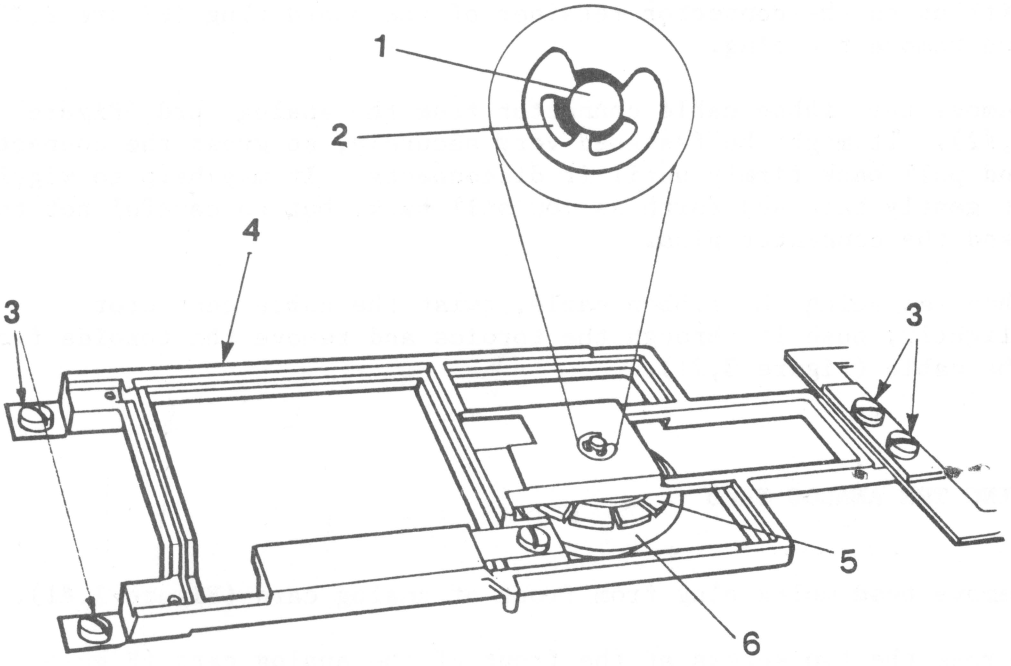


FIGURE 4

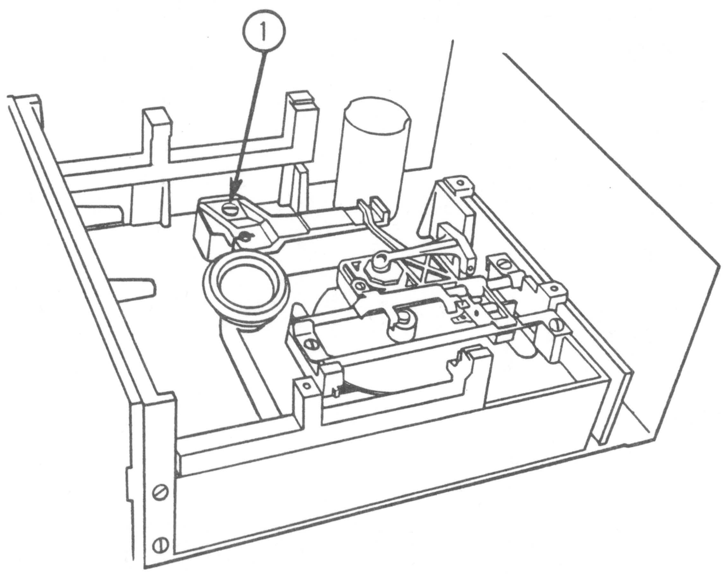


FIGURE 5

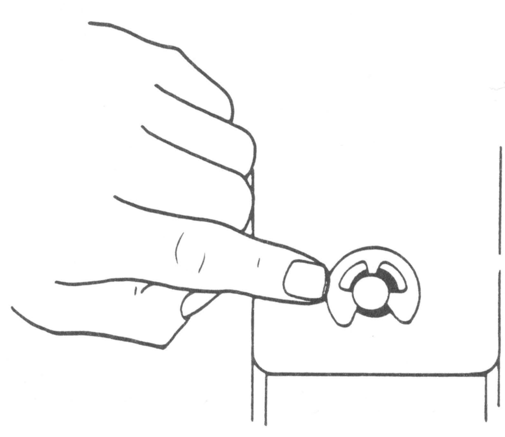


FIGURE 6

E. DISKETTE STOP GUIDE ADJUSTMENT

NOTE: It is almost never necessary to adjust the diskette stop guide. In fact, on some models the diskette stop guide (a black plastic gadget) has been eliminated and the stop is a part of the casting itself. Still, they get tinkered with, and when they are out of adjustment, the diskette can be so far off-center that the collet hub can't find center as it seats. This damages the diskette.

1. With the Disk Adjustment Tool centered, observe the Collect Hub (Figure 4,#5).
2. If tool cannot center properly because stop guide is too far forward, loosen stop guide mounting screw (Figure 5,#1), accessible through small round hole on left side of the tool, and allow guide to move back.
3. Center tool correctly and gently close the drive door.
4. Adjust stop guide so that it touches tool, then tighten mounting screw.
5. To adjust the Collet Hub look straight down on collet shaft, (Figure 4, #1) and close door. Check to see that shaft is centered.
6. Open and close door again, to see that the collet hub moves cleanly into the center of its receptacle.
7. Loosen four screws--two on back of bracket and two that hold bracket to door (Figure 4,#3).
8. Close door, ensuring that collet hub (Figure 4,#5) is seated in its receptacle (Figure 4,#6).
9. Looking straight down on collet shaft, move bracket around until shaft is centered in hole (Figure 4,#2).
10. Tighten rear screws.
11. Check by repeating STEPS 6 and 7.
12. As a further check, open the door and then push collet shaft off-center, (Figure 6), close and open door a few time, making sure that shaft reseats itself in the center of the hole.
13. Adjust the drive door if necessary (procedure follows).

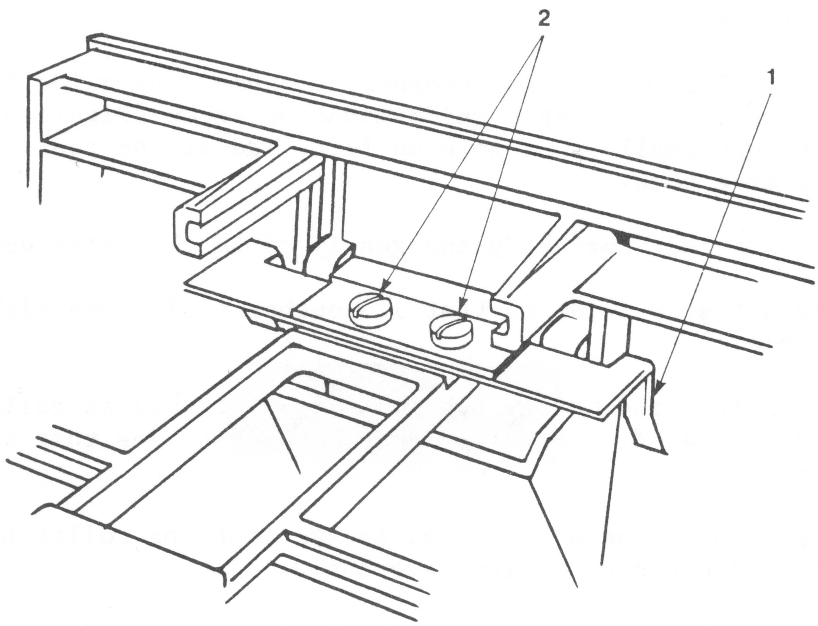


FIGURE 7

F. REPLACING AND ADJUSTING THE DRIVE DOOR

1. Remove two screws on each side of the front bezel (front panel) of the unit.

2. Tilt the bezel forward.

3. Remove the two screws holding the door in place and remove the door assembly.

4. Set the new door in place noting the position of the door guides (Figure 7,#1) and snug the screw to hold it in place.

5. Replace the bezel and hold it in place.

6. Insert Adjustment Tool into the drive and allow it to center properly.

7. While gently closing the drive door, observe the two guide bars (Figure 7,#1), which are visible when viewed from the back of the drive looking towards the front. There should be no binding between the guides and tool.

8. If there is binding, or if the door is crooked, tilt the bezel forward just enough the to be able to loosen the two screws that hold the door in place. Make sure the two plastic protrusions on the top of the door fit into the two plastic guides on the bezel and that the door looks centered.

9. With the bezel tilted forward, tighten the two screws to hold the door into position.

10. Put the bezel into its normal position and replace the four screws to hold it.

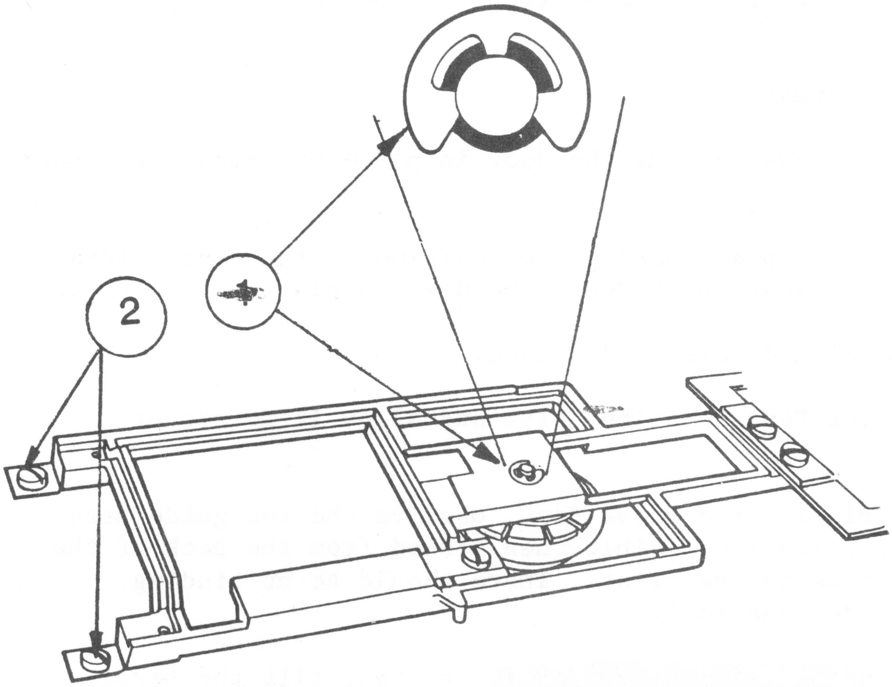


FIGURE 8

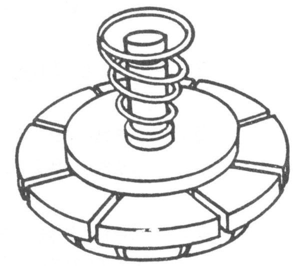


FIGURE 9

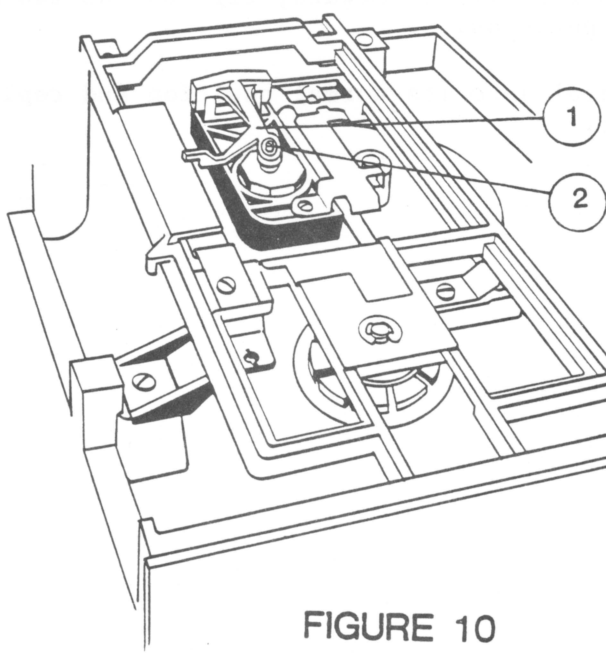


FIGURE 10

G. REPLACING THE COLLET HUB

1. Open the drive door.

2. Remove the two screws at the rear of the assembly (Figure 8,#2) that hold the bracket in place and remove it.

3. With a screwdriver pry the retaining clip (Figure 8) from the shaft holding the collet.

4. Remove the collet hub assembly and retain the spring and washer (Figure 9). Remove spring carefully, taking care not to stretch it.

5. Place the washer and spring on the new collet shaft--the spring goes on small end down--and insert into the mounting arm.

6. Install the retaining clip.

7. Set the bracket into position (Figure 8), making sure the two plastic protrusions on the top of the door slide into the guides on the bezel.

8. Push down on the collet hub to make sure it is centered, then secure the two screws to hold the bracket in place (Figure 8,#2).

H. REPLACING THE HEAD LOAD BUTTON

NOTE: Some Head Load Buttons are glued. If the glue cannot be broken, sent the unit to Level 2 for servicing.

1. Lift the Head Load Arm up (Figure 10,#1) and squeeze the top part of the load button (Figure 10,#2) with thin needle-nose pliers and drop button down.

2. Install a new load button by inserting it into the holder and pushing up until it snaps in place.

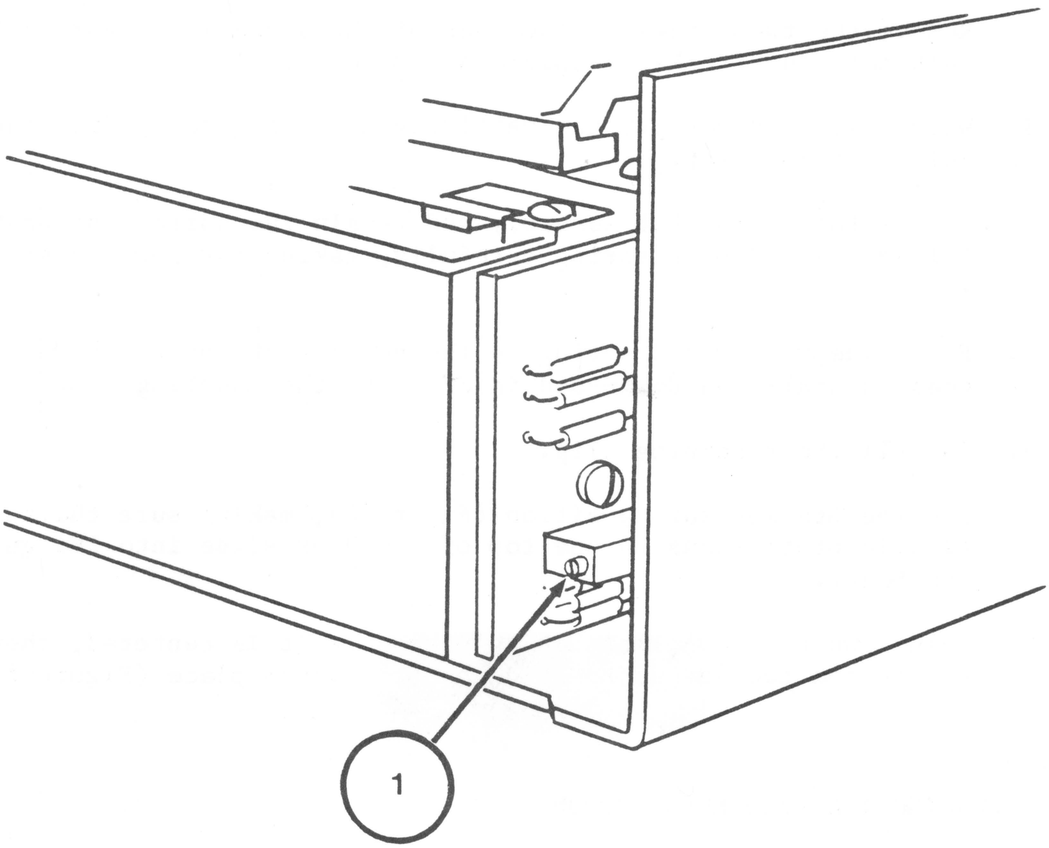


FIGURE 11

I. ADJUSTING THE SPEED -- THE D-SPEED TEST

1. Check that the power to the Apple /// is off.

2. Place the Apple][Emulation diskette in the internal drive (assuming it is working properly) and boot it up by turning the power on.

3. To the prompt "Boot Apple][Disk", place the Disk Alignment Aid diskette in the internal drive and hit return.

4. When the menu comes up, SET TARGET DISK will be highlighted. Accept it by pressing **A**.

5. Set target for drive 6, slot 2, by pressing **SAA**. Press ESC.

6. Select DSPEED test (press **SSSA**).

7. The screen will warn you that the test will write on the diskette. Put your scratch (or a blank formatted) diskette in the target drive and press A again.

   NOTE: At this point, the screen should show a scale with -100 on the left and +100 on the right, with a marker indicating the relative speed of the drive.

8. Look at the back of the drive mechanism. Locate the Motor Control Card, mounted on the edge, and note the small grey helipot with a screwdriver adjustment on the side (Figure 11,#1).

   NOTE: Do not confuse this with the helipot(s) on the analog card!

9. With a small flatblade screwdriver adjust the helipot and note how the indicator on the screen moves back and forth, showing changes of speed.

10. Set the speed so that it indicates between -5 and 0.

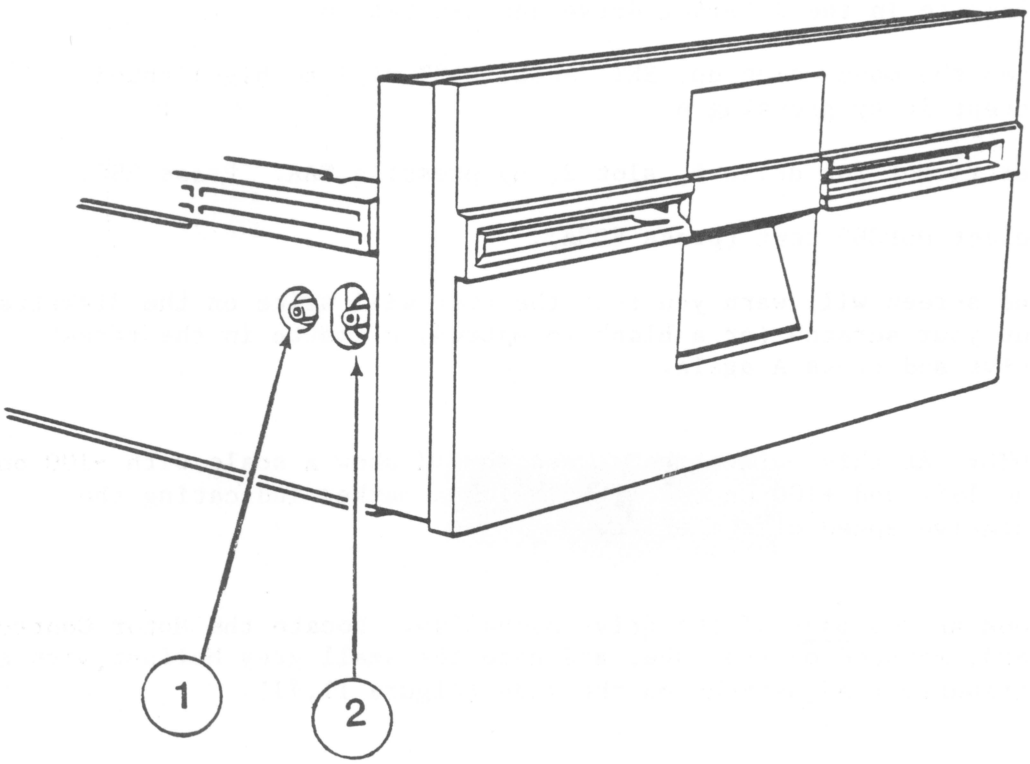


FIGURE 12

J. WRITE PROTECT SWITCH ADJUSTMENT

1. Using the same set-up you had for the previous exercise, select WRT PROTECT SWITCH.

2. Note the two setscrews holding the write-protect switch in place (Figure 12,#1 & 2). The switch is located on front left side of housing as you face drive door. The far setscrew, (Figure 12,#1), forms a pivot for switch; the near setscrew (Figure 12,#2), sets switch position.

3. Insert Disk-Adjustment Tool all the way and leave the disk drive door open.

   NOTE: Some drives will scrape on the adjustment tool. If you have one that does, use a diskette instead of the tool.

4. Loosen the rear setscrew, then loosen the front setscrew and raise up on it (Figure 12,#2) until the switch disables, and tighten setscrew.

5. Tighten rear setscrew (Figure 12,#1).

6. Check by withdrawing Adjustment Tool to the Slot 1 position. Switch should be enabled.

   NOTE: If switch continues to show a disabled condition, reboot and try the procedure again.

7. Verify again, using Adjustment Tool in both Slot 1 and Slot 2 positions.

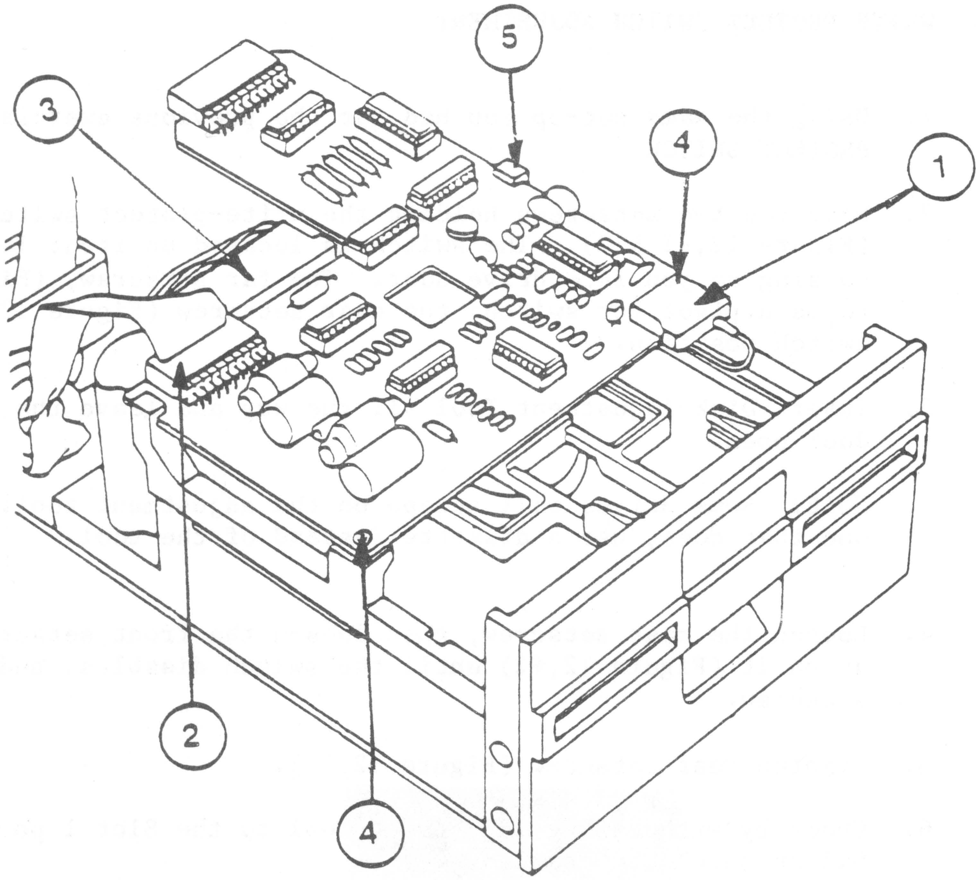


FIGURE 13



FIGURE 14

K. REPLACING THE ANALOG CARD

1. Slide the analog card through the retaining slots (Figure 13,#5) and into position.

2. Replace two screws to hold board in place (Figure 13,#4).

3. Attach the head molex plug to the front of the analog card (Figure 13,#1). Ensure that there is just enough loop in the cable so that it doesn´t pull down on the head molex plug.

L. REPLACING THE RIBBON CABLE

4. Place the two toroids onto one end of the replacement cable looping the cable through the toroids and leaving about 3 inches of cable between the toroids and the connector (Figure 14).

5. Place the cable just above the toroids into the nylon cable holder and snap the holder shut.

6. Attach the ribbon cable connector to the analog card, making sure that both rows of pins align with the holes in the connector (Figure 13,#2).

7. Attach the analog card board plug at the end of the analog card (Figure 13,#3). The gripper of the retainer will slip into the hole when it is in place.

8. Replace the strain relief guard at the back of the metal shield. Fit the guard as close as possible to the toroid while leaving yourself enough cable to work with. Make an "S" in the cable right next to the metal shield. Fit the bottom portion of the "S" into the one part of the strain relief with the triangle side fitting inside the metal shield. The other part of the strain relief fits with the triangle against the cable and into the lower portion of the strain relief. The top part then slips inside the metal shield (Figure 15).

9. Replace the four screws on the side of the metal shield.

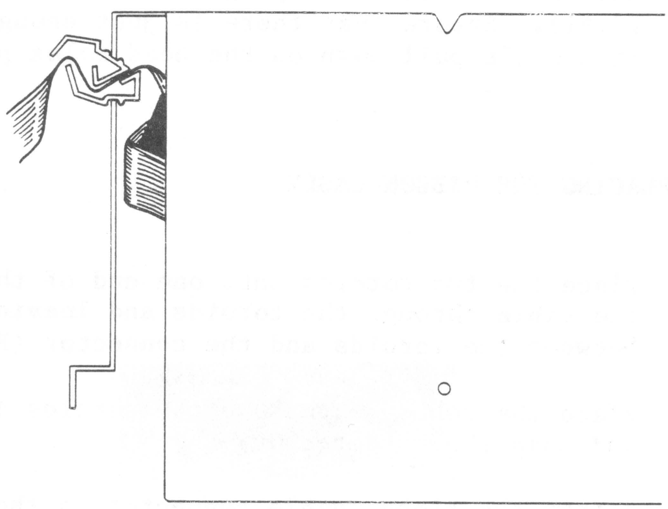


FIGURE 15

M. REPLACING THE COVER

10. Replace the top cover. With the unit top side up, set cover over back edge of Disk /// then pull the cover slightly forward as you slide it down over the disk drive door.

11. Replace the single Phillips screw on the back panel.

12. Turn the drive over and replace the bottom cover.

13. Replace four Phillips screws and turn drive top side up.

14. Reconnect any daisy-chained drive on the rear panel of Disk ///.

15. Reconnect Disk /// on the rear panel of the Apple ///.

N. DISASSEMBLY/ASSEMBLY CHECKLIST

Disassembly Procedures

____ 1. Turn the Apple ///'s power off.
____ 2. Unplug the disk drive from the rear connector of the Apple ///.
____ 3. Unplug any other daisy-chained drives from the rear panel of the drive to be repaired.
____ 4. Remove disk drive cover.
____ 5. Remove strain relief.
____ 6. Remove metal shield.
____ 7. Disconnect head molex plug, board plug and ribbon cable connector from the analog card.
____ 8. Remove analog card.

Adjustments

____ 1. Replace/Adjust disk drive door.
____ 2. Adjust diskette stop guide.
____ 3. Replace collet hub.
____ 4. Replace head load button.
____ 5. Adjust the speed.
____ 6. Adjust write protect switch.

Assembly Procedures

____ 1. Replace analog card.
____ 2. Connect head molex plug, board plug, and ribbon cable connector on the analog card.
____ 3. Replace metal shield.
____ 4. Replace strain relief.
____ 5. Replace disk drive cover.
____ 6. Connect any daisy-chained drives to the rear panel of the drive.
____ 7. Connect the disk drive to the rear connector of the Apple ///.

apple computer

DISK /// TECHNICAL PROCEDURES

Contents

SECTION 2

ANALOG CARD REPAIR

Contents:

Introduction

The following pages outline the Level 1 repair procedures for the Disk /// disk drive analog card, which is used in the Apple® /// Personal Computer. In order to thoroughly test the analog card, follow **ALL** of the procedures in this section. Doing this will ensure that no potential problems are overlooked.

Materials Required:

Apple /// Personal Computer
External Disk][or /// mechanical assembly
External Disk /// Interface cable
Disk Alignment Aid diskette (Apple p/n: 652-0199)
Apple][Emulation diskette (Apple p/n: 681-0002)
Copy of DOS 3.3 System Master diskette (non-write protected)
Copy of Business Basic diskette (Apple p/n: 681-0005)
Blank diskette
Small jewelers' screwdriver

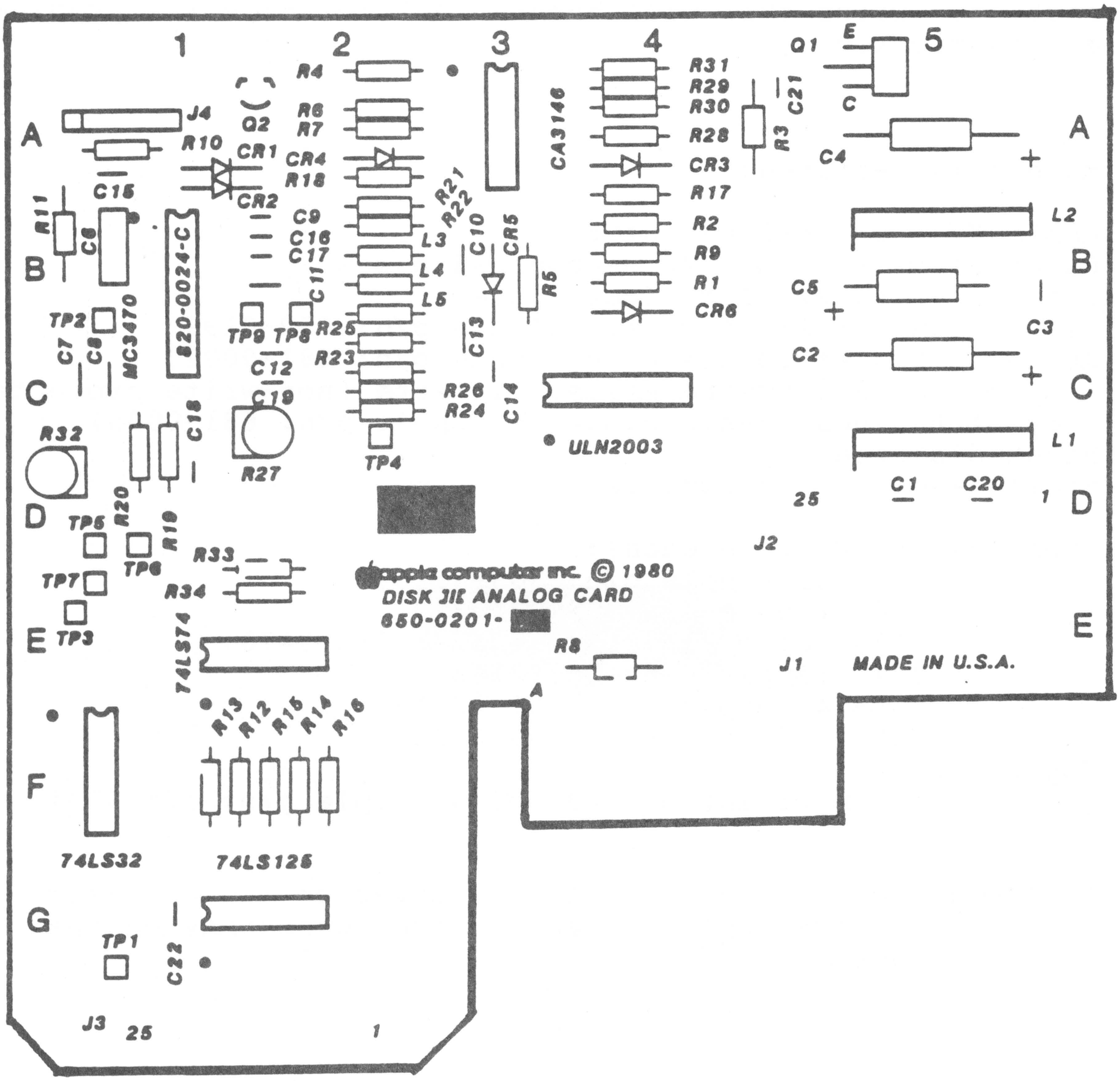
Replacement ICs (one each):

- 74LS125 (Apple p/n: 305-0125)
- 2003 (Apple p/n: 327-2003)
- 3470 (Motorola) (Apple p/n: 355-3470)
- 3146 (Apple p/n: 351-3146)
- 74LS74 (Apple p/n: 305-0074)
- 74LS32 (Apple p/n: 305-0032)

Capacitor C4:

- 470 microfarad, 6.3 volts (Apple p/n: 125-6701)

CAUTION: Be sure to turn off the power to the computer before replacing any of the components on the analog card.


1
2
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4
5
A
B
C
D
E
F
G
J4
Q2
R10
CR1
CR2
C15
R11
C8
820-0024-C
MC3470
TP2
C7
C6
R4
R6
R7
CR4
R18
C9
C16
C17
C11
R21
R22
L3
L4
L5
C10
CR5
R5
C13
TP9
TP8
R25
R23
C12
C19
R26
R24
C14
TP4
R27
R32
C18
R20
R19
TP5
TP6
TP7
TP3
R33
R34
CA3146
R31
R29
R30
R28
CR3
R17
R2
R9
R1
CR6
R3
C21
Q1
E
C
C4
L2
C5
C3
C2
L1
ULN2003
C1
C20
25
1
J2
apple computer inc. © 1980
DISK /// ANALOG CARD
650-0201- [redacted]
R8
J1
MADE IN U.S.A.
74LS74
R13
R12
R15
R14
R16
74LS32
74LS125
TP1
C22
J3
25
1

System Setup

For the analog card to be correctly diagnosed, it must be the only unknown variable in the test system. Using all known-good, verified components, assemble them as follows:

1. Place the analog card to be tested on the external drive mechanical assembly and connect the mechanical assembly cable and head cable.

2. Connect the external cable between the analog card and the external drive port.

Visual Inspection

Inspect the analog card for out-of-date versions or signs of PCB (Printed Circuit Board) reworking, such as:

a. R 32 (location D1) is missing

b. The IC at location E1 is missing

c. Jumper wires soldered to the back of the PCB

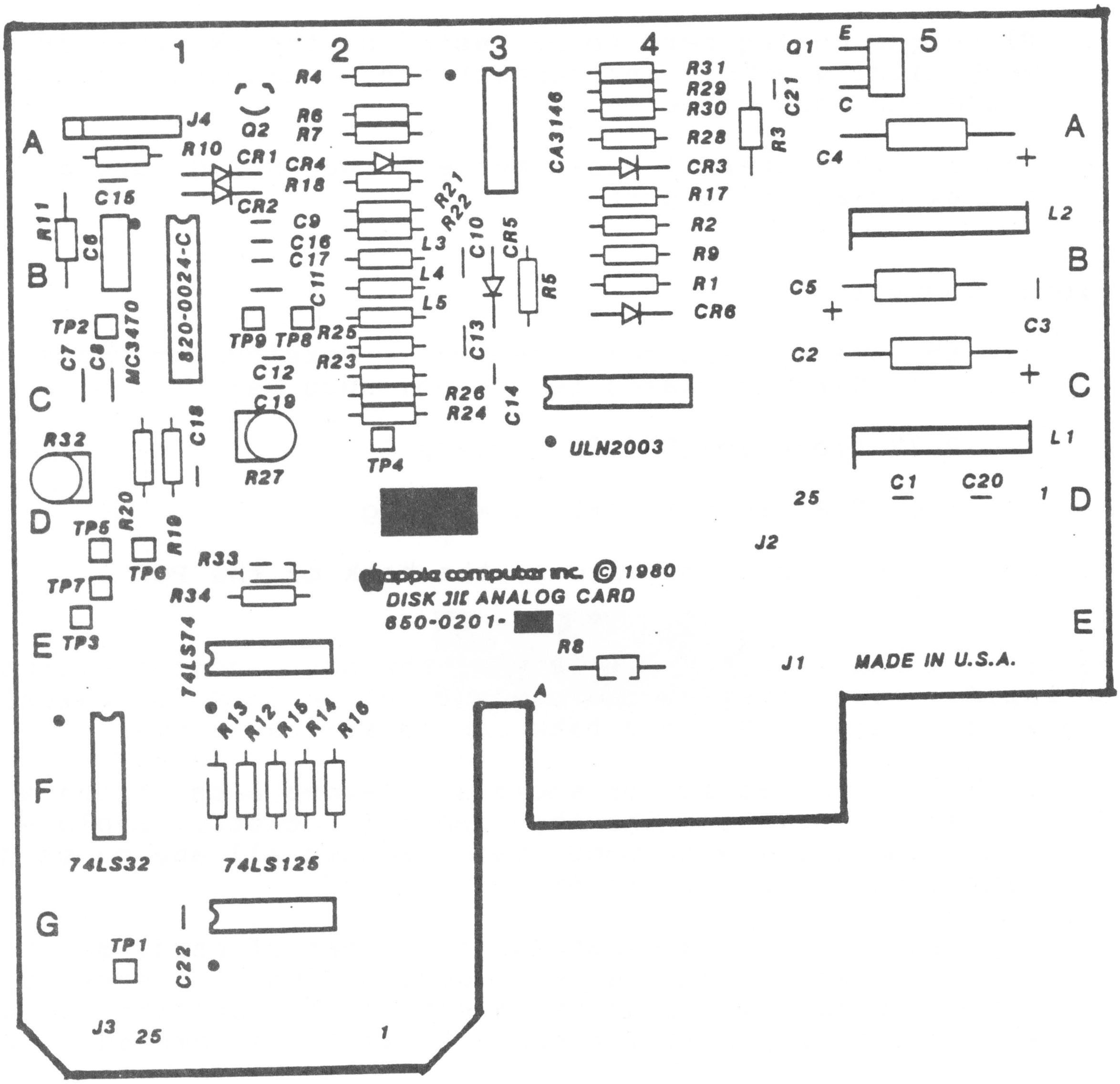
Return all analog cards with any of the above configurations to Apple. Next, examine the suspect analog card for visual signs of damage. This may take one of several forms:

1. Burned or melted ICs or sockets. Remove each of the six ICs and closely examine them and the sockets. Replace all damaged ICs with good ones. Return all analog cards with damaged sockets to Apple.

2. Capacitor C4 (large capacitor at corner of card) may be visibly damaged (burned, exploded, melted). Observing correct polarity (match the + end of the capacitor to the + on the analog card), replace C4 if it is damaged.

3. Components other than the six ICs and capacitor C4 may be physically damaged and in need of replacement. These cards should be returned to Apple for repair.

WARNING: Do not use an eraser to clean gold contacts. Use only a liquid or spray contact cleaner and a clean cloth.


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A
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C
D
E
F
G
J4
Q2
R10
CR1
CR4
CR2
R4
R6
R7
R18
C9
C16
C17
C11
R21
R22
L3
L4
L5
C10
CR5
R5
C13
C14
R25
R23
R26
R24
CA3146
R31
R29
R30
R28
CR3
R17
R2
R9
R1
CR6
R3
C21
Q1
E
C
C4
L2
C5
C3
C2
L1
C1
C20
25
1
J2
J1
MADE IN U.S.A.
C15
R11
C6
820-0024-C
MC3470
TP2
C7
C8
TP9
TP8
C12
C19
R32
C18
R27
TP4
ULN2003
R20
R19
TP5
TP6
TP7
TP3
R33
R34
apple computer inc. © 1980
DISK /// ANALOG CARD
650-0201-[redacted]
R8
A
74LS74
R13
R12
R15
R14
R16
74LS32
74LS125
TP1
C22
J3
25
1

Troubleshooting

A malfunctioning analog card may manifest symptoms in one of five ways:

Drive 1 will not boot (with bad external drive analog card connected).
Drive will not read or write (could destroy data).
Drive has trouble reading.
Drive has trouble writing.
Diskette-switched circuit malfunctions.

A troubleshooting procedure for each failure mode follows.

System Will Not Boot

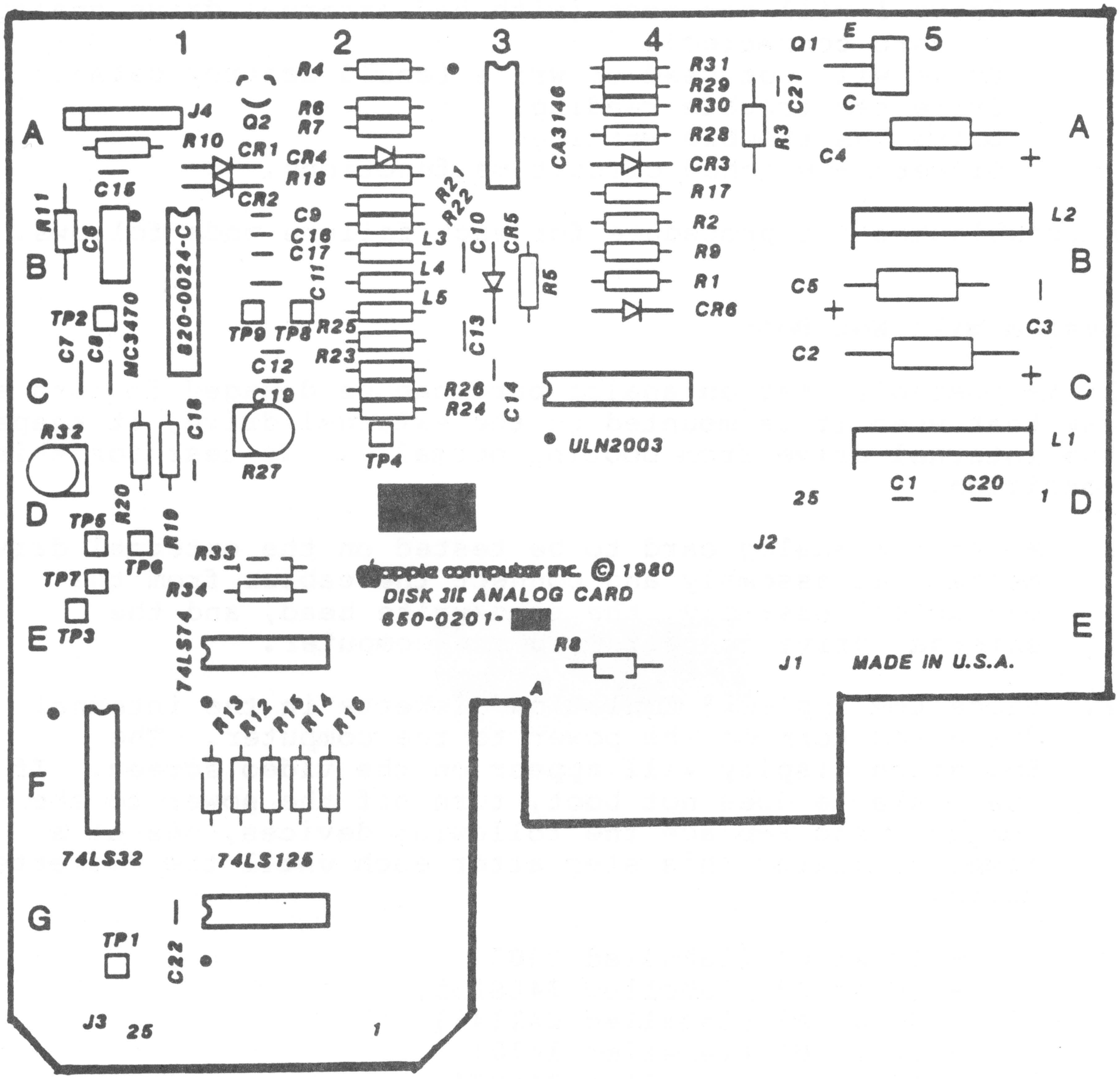
It is possible that an analog card can be damaged in such a way that when it is mounted on the external drive, it keeps the internal drive from booting normally. To test for this condition:

1. Mount the analog card to be tested on the external drive mechanical assembly and connect the cables from the mechanical assembly, the read/write head, and the external drive connector on the computer.

2. Place the Apple][Emulation diskette in the internal drive and turn on the power to the computer. The Emulation display will appear on the video screen. If the diskette does not boot, turn off the power to the computer and replace the following devices, one at a time, repeating this step after each until the diskette boots.

   - IC at C4 (labelled 2003)
   - IC at G2 (labelled 74LS125)
   - IC at A3 (labelled CA3146)
   - IC at B1 (labelled 3470)
   - IC at E2 (labelled 74LS74)

If the emulation diskette still fails to boot, place all original ICs in their sockets and return the analog card to Apple.


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DISK /// ANALOG CARD
650-0201-
MADE IN U.S.A.
1 2 3 4 5
A B C D E F G
J1 J2 J3 J4
25 1
Q1 Q2
E C
CA3146
ULN2003
MC3470
820-0024-C
74LS74
74LS32
74LS125
R1 R2 R3 R4 R5 R6 R7 R8 R9 R10 R11 R12 R13 R14 R15 R16 R17 R18 R19 R20 R21 R22 R23 R24 R25 R26 R27 R28 R29 R30 R31 R32 R33 R34
C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12 C13 C14 C15 C16 C17 C18 C19 C20 C21 C22
CR1 CR2 CR3 CR4 CR5 CR6
L1 L2 L3 L4 L5
TP1 TP2 TP3 TP4 TP5 TP6 TP7 TP8 TP9

Drive Will Not Read or Write

If the emulation diskette boots successfully in the internal drive, perform the following steps:

1. Place the Disk Alignment Aid diskette in the internal drive and a good blank diskette in the external drive and press <RETURN>. The Disk alignment Aid diskette should boot and display the menu on the screen.

2. Press the A key. The video screen will display the **SET TARGET DISK** menu.

3. Press the S key to highlight the **SET DRIVE** selection.

4. Press the **A** key to select **SET DRIVE** option.

5. Press the A key to accept the external drive as the target drive.

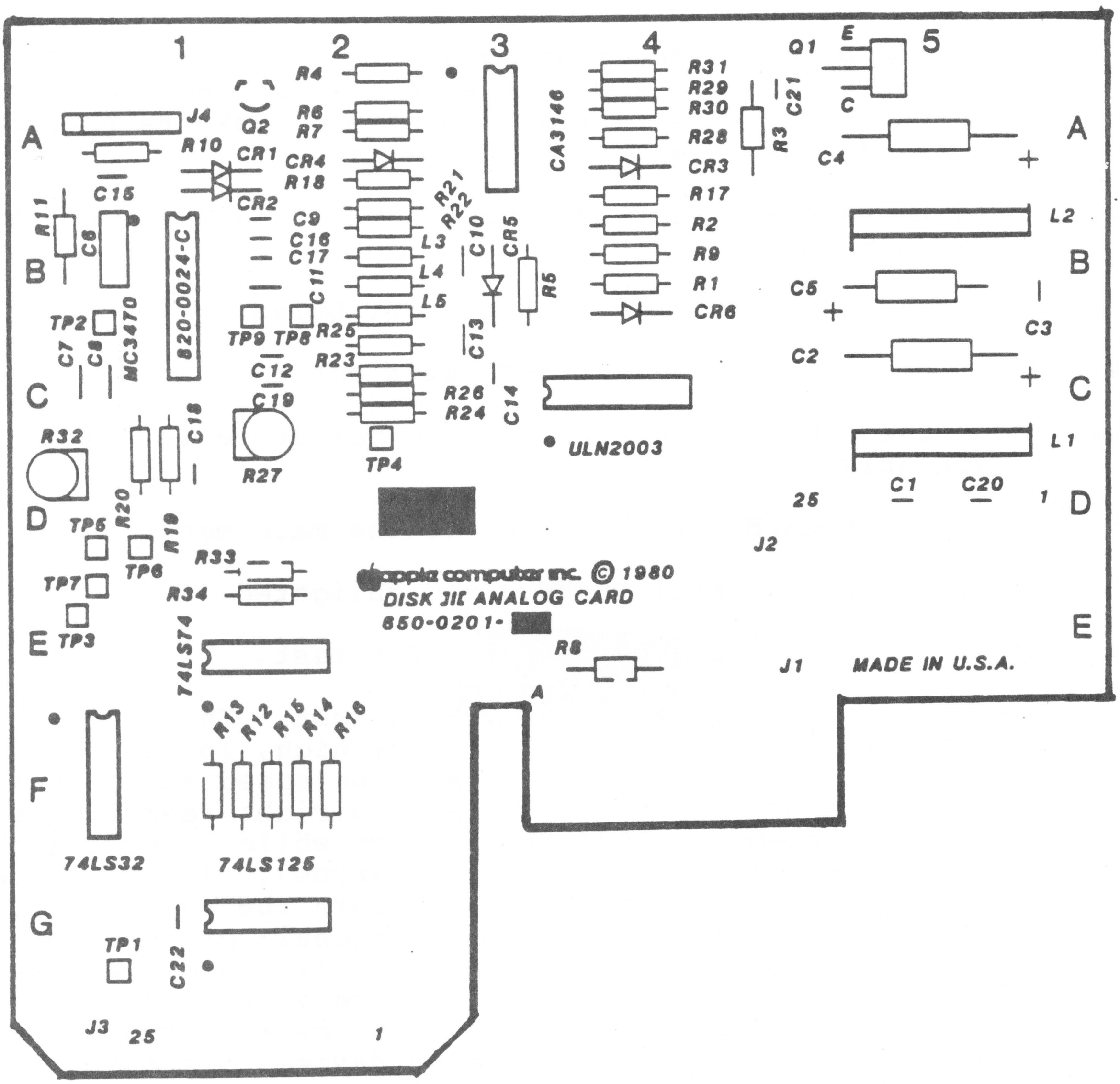
6. Press the **ESCAPE** key to return to the main menu.

7. Press the **S** key until **DSPEED** is highlighted.

8. Press the A key to accept the **DSPEED** test.

9. Press the **A** key to begin the DSPEED test. The video screen will display a scale with the high, low and current disk speed values. Locate the speed adjustment screw on the motor control PCB at the right rear of the mechanical assembly. Adjust this pot while observing the current speed value and indicator (arrow). If the value changes and the arrow moves as you turn the adjustment, this portion of the circuit is functional; proceed to the **Drive Has Trouble Reading** procedure. If the drive speed indicator does not move to reflect the speed adjustment, this circuit is faulty; turn off the power to the computer and replace the following devices (except those which have been replaced previously), one at a time, repeating this test after each device until the indicator moves reflecting the speed changes:

    - IC at B1 (labelled 3470)
    - IC at A3 (labelled 3146)
    - IC at G4 (labelled 74LS125)
    - IC at C4 (labelled 2003)
    - IC at E2 (labelled 74LS74)
    - IC at F1 (labelled 74LS32)


1 2 3 4 5
A B C D E F G
J4 Q2 R4 R6 R7 R10 CR1 CR4 R18 CR2 C15 R11 C6 C9 C16 C17 C11 L3 L4 L5 R21 R22 C10 CR5 R5 C13 CA3146
R31 R29 R30 R28 CR3 R17 R2 R9 R1 CR6 R3 C21 Q1 E C C4 L2 C5 C3 C2 L1 C1 C20
820-0024-C MC3470 TP2 C7 C8 TP9 TP8 R25 R23 C12 C19 R26 R24 C14 TP4 ULN2003
R32 C18 R27 R20 R19 TP5 TP6 TP7 TP3 R33 R34 74LS74
apple computer inc. © 1980
DISK /// ANALOG CARD
650-0201-
R8 A J1 J2 25 1 MADE IN U.S.A.
R13 R12 R15 R14 R16 74LS32 74LS125 C22 TP1 J3 25 1

If you replace all of the ICs on the analog card and the DSPEED indicator still fails to move, perform the **COMPARATOR OFFSET ADJUSTMENT** located in the adjustment procedures of the Disk][Technical Procedures section. If the analog card still fails to function properly, place all original ICs in their sockets and return the card to Apple.

Drive Has Trouble Reading

If the drive will perform the DSPEED test successfully, perform the following steps:

1. Boot the Apple][Emulation diskette in the internal drive.

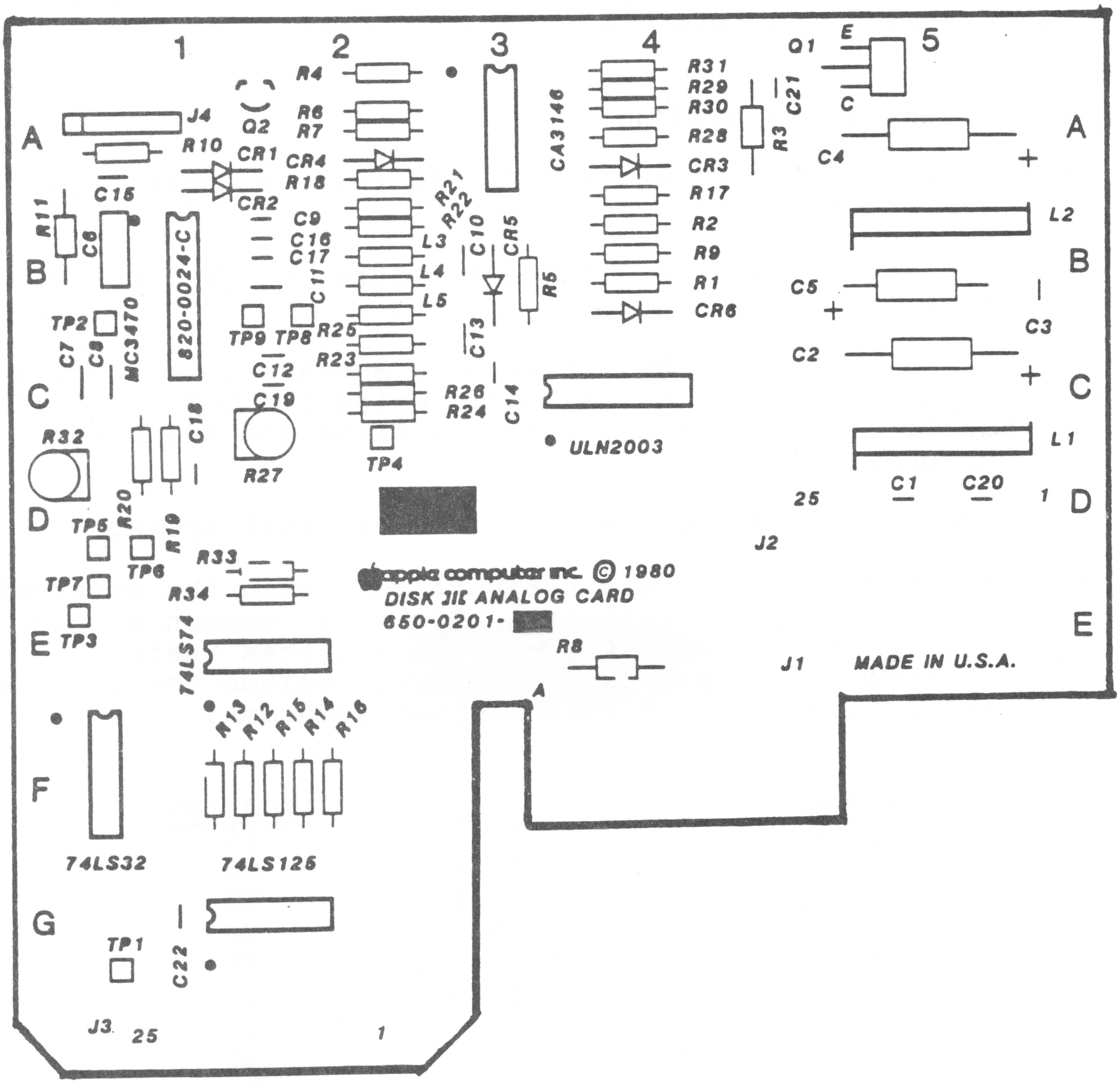
2. Once the Apple][Emulation menu appears on the screen, complete the boot process by placing the DOS 3.3 System Master diskette in the internal drive and pressing **<RETURN>**.

3. Move the DOS 3.3 diskette to the external drive.

4. Type **CATALOG,D2**, press <RETURN> and watch the external drive closely for activity. The video screen should display the catalog of the DOS 3.3 System Master diskette. If this does not occur, replace the following devices according to the observed symptoms:

SYMPTOM	IC	LOCATION
IN-USE light off	74LS32	F1
" "	74LS125	G2
" "	2003	C4
" "	74LS74	E2
Motor off, IN-USE light on	74LS32	F1
Head does not move	2003	C4
Head moves erratically	2003	C4
Recalibrates repeatedly	3470	B1
I/O ERROR	3470	B1
" "	3146	A3
" "	74LS125	G2
" "	2003	C4
" "	74LS32	F1
" "	74LS74	E2

If you have replaced all of the ICs on the analog card and the catalog still does not appear on the monitor, perform the **COMPARATOR OFFSET ADJUSTMENT** located in the calibration procedures of the Disk][Technical Procedures section. If the analog card still fails to function properly, place all original ICs in their sockets and return the card to Apple.



1 2 3 4 5
A B C D E F G
J4 Q2 R10 CR1 CR2 R4 R6 R7 CR4 R18 C9 C16 C17 C11 R21 R22 L3 L4 L5 C10 CR5 R5 C13 C14
R25 R23 R26 R24 TP9 TP8 C12 C19 R27 TP4
CA3146 R31 R29 R30 R28 CR3 R17 R2 R9 R1 CR6 R3 C21
Q1 E C C4 L2 C5 C3 C2 L1 C1 C20 25 1 J2
R11 C15 C6 MC3470 820-0024-C TP2 C7 C8 R32 C18 R20 R19 TP5 TP6 TP7 TP3 R33 R34
ULN2003
apple computer inc. © 1980
DISK /// ANALOG CARD
650-0201-[redacted]
R8 J1 MADE IN U.S.A. A
74LS74 R13 R12 R15 R14 R16
74LS32 74LS125
TP1 C22
J3 25 1

Drive Has Trouble Writing

If the analog card correctly displays the catalog of the external drive, perform the following steps:

1. Type **CATALOG,D2** and press <RETURN>. The catalog will be displayed on the video screen. Files displayed with an asterisk (*) preceding the filename are locked and may not be deleted. Note that filename HELLO is preceded by an asterisk.

2. Type **UNLOCK HELLO** and press <RETURN>.

3. Type **CATALOG** and press <RETURN>. The catalog will be displayed on the video screen. Verify that filename HELLO is not preceeded by an asterisk. If you encounter trouble when attempting to unlock the file, turn off the power to the computer and replace the following devices (except those which have been replaced previously), one at a time, repeating this test after each device until the UNLOCK command executes successfully:

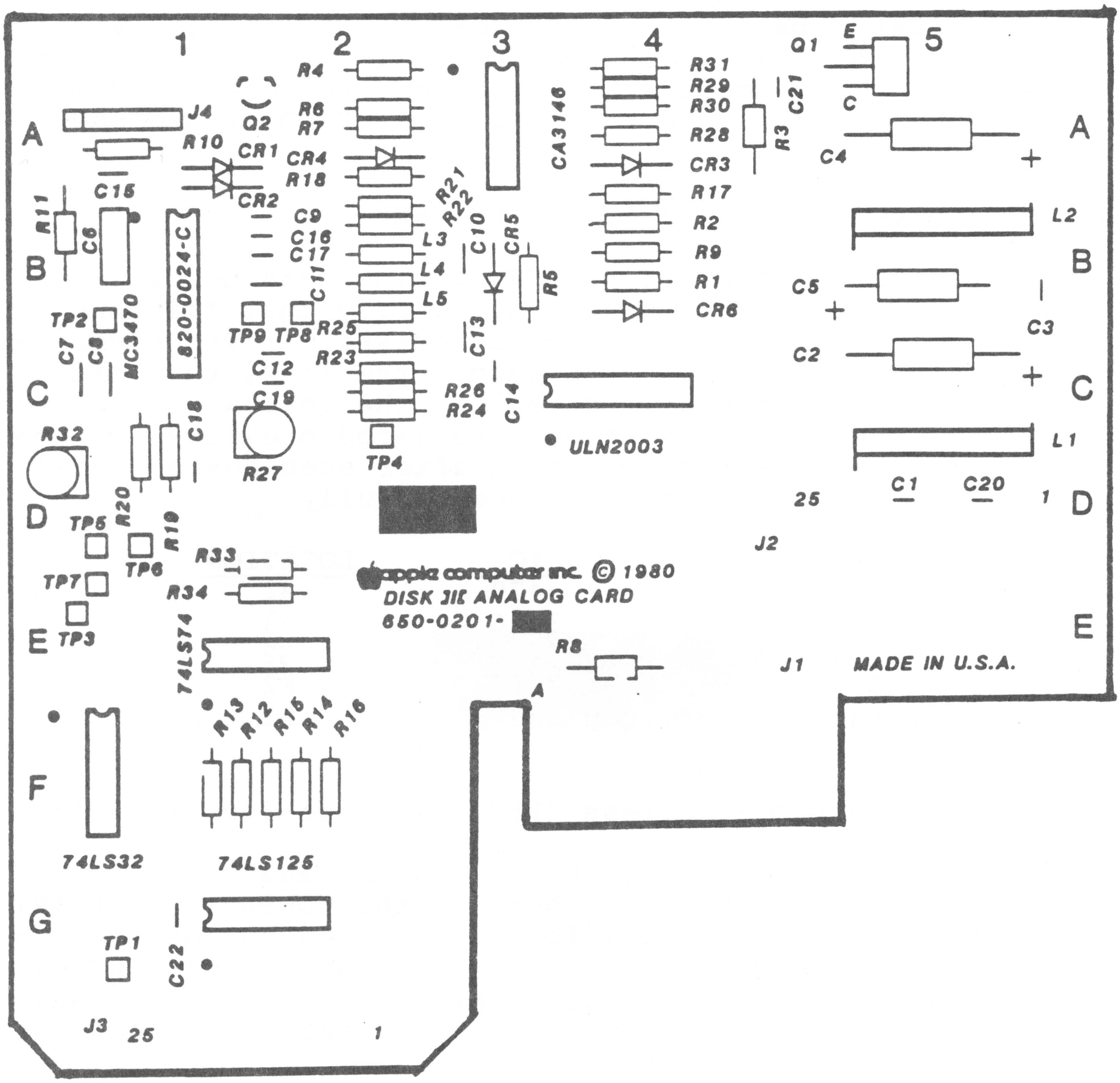
SYMPTOM	IC	LOCATION
I/O ERROR	3470	B1
" "	3146	A3
WRITE PROTECTED error	74LS125	G2
" "	74LS74	E2
Recalibrates Repeatedly	3470	B1

4. Type **LOCK HELLO** and press <RETURN> to re-lock the file.

If you have replaced all of the ICs on the analog card and you still experience trouble, perform the **COMPARATOR OFFSET ADJUSTMENT** located in the calibration procedures of the Disk][Technical Procedures section. If the analog card still fails to function properly, place all original ICs in their sockets and return the card to Apple. Otherwise, go on to the next procedure.

Write-Protect Switch Circuit Malfunctions

1. Place a write-protect tab on the DOS 3.3 System Master diskette and insert the diskette back in the external drive.


1
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A
B
C
D
E
F
G
J4
Q2
R10
CR1
CR2
C15
R11
C6
820-0024-C
MC3470
TP2
C7
C8
TP9
TP8
C12
C19
R27
R32
C18
R20
R19
TP5
TP6
TP7
TP3
R33
R34
74LS74
R13
R12
R15
R14
R16
74LS32
74LS125
TP1
C22
J3
25
1
R4
R6
R7
CR4
R18
C9
C16
C17
C11
R25
R23
R21
R22
L3
L4
L5
C10
CR5
R5
C13
R26
R24
C14
TP4
CA3146
ULN2003
R31
R29
R30
R28
CR3
R17
R2
R9
R1
CR6
R3
C21
Q1
E
C
C4
L2
C5
C3
C2
L1
C1
C20
J2
apple computer inc. © 1980
DISK /// ANALOG CARD
650-0201-
R8
J1
MADE IN U.S.A.

2. Repeat steps 2 and 3 above (in the **DRIVE HAS TROUBLE WRITING** procedure). The video screen should display **WRITE PROTECTED** error. If this does not occur, replace the following device (unless it has been replaced previously) according to the symptom listed, and repeat this test.

SYMPTOM	IC	LOCATION
File remains locked	74LS125	G2
" "	74LS74	E2
I/O ERROR	74LS125	G2
" "	74LS74	E2
" "	74LS32	F1

If the screen still does not display **WRITE PROTECTED** error, place all original ICs in their sockets and return the analog card to Apple.

Diskette-Switched Circuit Malfunctions

The diskette-switched circuit detects the changing of the diskette. Due to the difference in the way the computer reads the directory in Apple // Emulation mode, this circuit must be tested in Apple][Emulation mode as well as Apple /// mode.

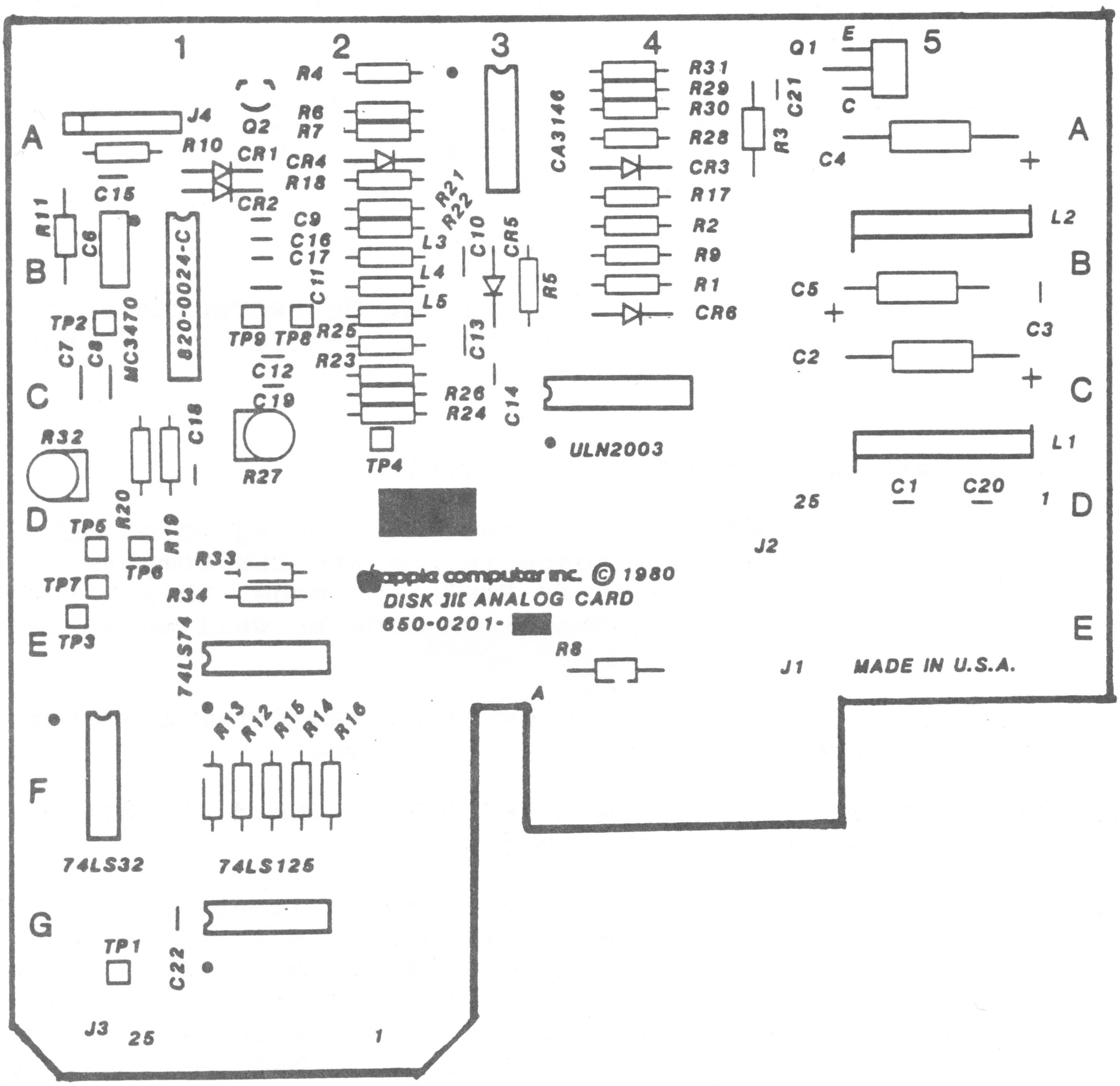
1. Boot the Business Basic diskette in the internal drive and then move it to the external drive.

2. Type **CATALOG .D2** and press **<RETURN>**. The disk catalog will display on the video screen.

3. Rest the eraser end of a common pencil lightly on the cam of the external drive mechanism and hold it there while carefully observing it. Type **CATALOG .D2** again and press <RETURN>. Watch the drive cam for movement; you should <u>NOT</u> feel the pencil move at all. If the cam does move at all, replace the following devices (unless they have been replaced previously) one at a time, and repeat this test. If the analog card still fails to function properly, place all original ICs in their sockets and return the card to Apple. Otherwise, go on to the next step.

   - IC at E2 (labelled 74LS74)
   - IC at F1 (labelled 74LS32)

4. Remove the diskette from the external drive and re-insert it.



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DISK /// ANALOG CARD
650-0201-
MADE IN U.S.A.
CA3146
ULN2003
MC3470
820-0024-C
74LS74
74LS32
74LS125
J1
J2
J3
J4
Q1
Q2
TP1
TP2
TP3
TP4
TP5
TP6
TP7
TP8
TP9

5. With the pencil eraser resting on the drive cam, type **CATALOG .D2** and press **<RETURN>** and observe the cam for movement; you **SHOULD** feel the pencil move. If the cam does not move at all, replace the following devices (unless they have been replaced previously) one at a time, and repeat this test. If the analog card still fails to function properly, place all original ICs in their sockets and return the card to Apple. Otherwise, go on to the next step.

   - IC at E2 (labelled 74LS74)
   - IC at F1 (labelled 74LS32)

6. Repeat step 5 (above). This time, the cam should **NOT** move. If the cam moves at all, replace the following devices (unless they have been replaced previously) one at a time, and repeat this test. If the analog card still fails to function properly, place all original ICs in their sockets and return the card to Apple. Otherwise, go on to the next step.

   - IC at E2 (labelled 74LS74)
   - IC at F1 (labelled 74LS32)

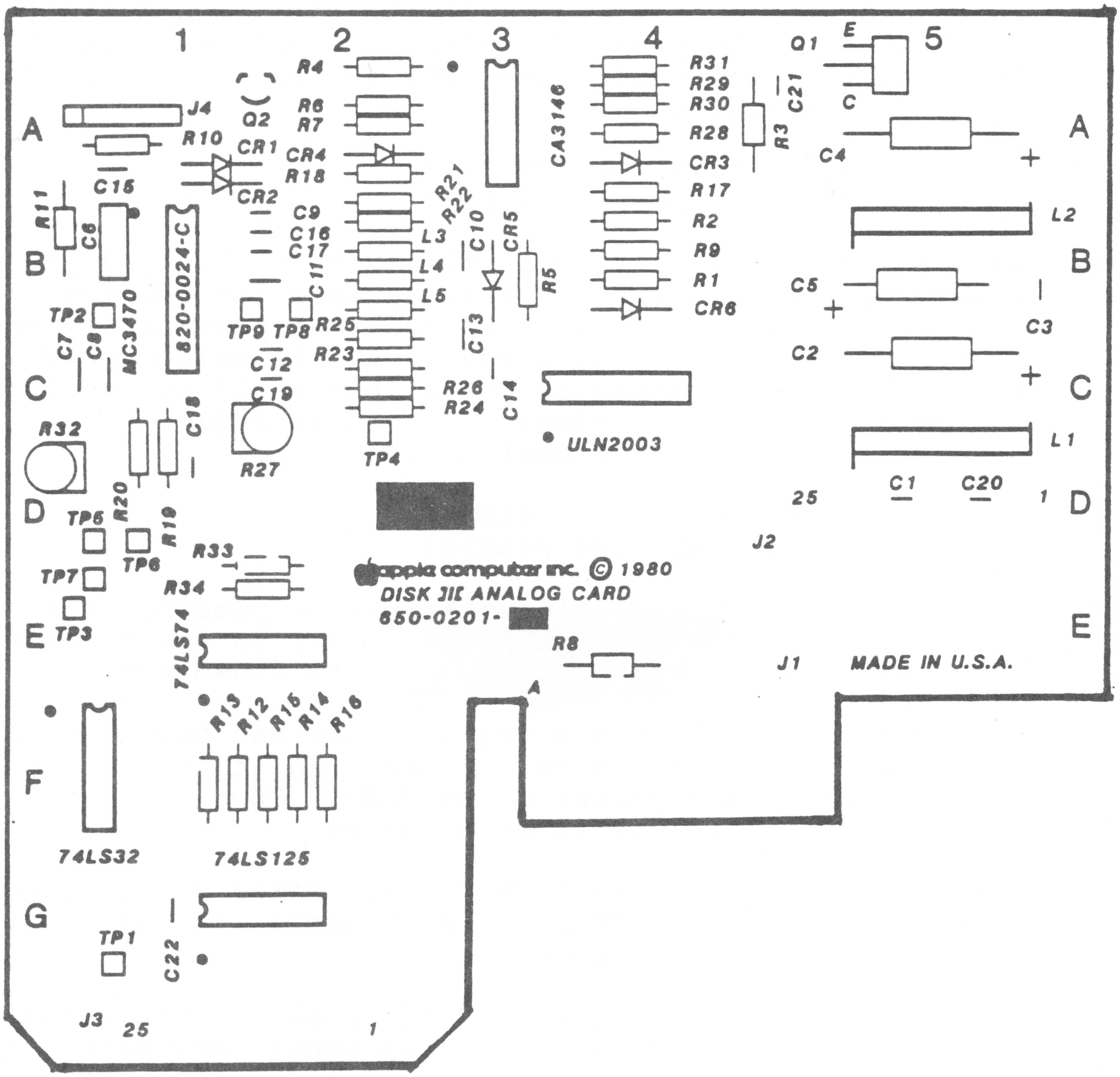
7. Boot the Apple][Emulation diskette by placing it in the internal drive and turning on the power to the computer. The Emulation display will show on the video screen.

8. Remove the Apple][Emulation diskette and boot the DOS 3.3 System Master diskette by inserting it in the internal drive and pressing **<RETURN>**. Once it has booted, move it to the external drive.

9. Type **CATALOG,D2** and press **<RETURN>**. After the catalog is displayed, press <**RETURN**>. the Applesoft prompt (**]**) will appear on the video screen.

10. Place the pencil eraser on the drive cam. Type **CATALOG** again and press **<RETURN>**. The cam should **NOT** move. If the cam moves at all, replace the following devices (unless they have been replaced previously) one at a time and repeat this test. If the analog card still fails to function properly, place all original ICs in their sockets and return the card to Apple.

   - IC at E2 (labelled 74LS74)
   - IC at F1 (labelled 74LS32)


1
2
3
4
5
A
B
C
D
E
F
G
J4
Q2
R10
CR1
CR2
C15
R11
C6
MC3470
820-0024-C
C7
C8
TP2
TP9
TP8
R4
R6
R7
CR4
R18
C9
C16
C17
C11
R25
R23
C12
C19
R27
R21
R22
L3
L4
L5
C10
CR5
R5
C13
R26
R24
C14
TP4
CA3146
R31
R29
R30
R28
CR3
R17
R2
R9
R1
CR6
R3
C21
Q1
E
C
C4
L2
C5
C3
C2
L1
ULN2003
C1
C20
25
1
J2
R32
C18
R20
R19
TP5
TP6
TP7
TP3
R33
R34
74LS74
apple computer inc. © 1980
DISK ///E ANALOG CARD
650-0201-
R8
J1
MADE IN U.S.A.
R13
R12
R15
R14
R16
74LS32
74LS125
TP1
C22
J3
25
1

11. Remove the DOS 3.3 System Master diskette from the external drive and replace it in the same drive. Repeat step 10 (above) and check that the cam does **NOT** move. If the cam moves at all, replace the following devices (unless they have been replaced previously) one at a time, and repeat this test. If the analog card still fails to function properly, place all original ICs in their sockets and return the card to Apple.

    - IC at E2 (labelled 74LS74)
    - IC at F1 (labelled 74LS32)

Disk Drive /// Technical Procedures

Section 3

Illustrated Parts List

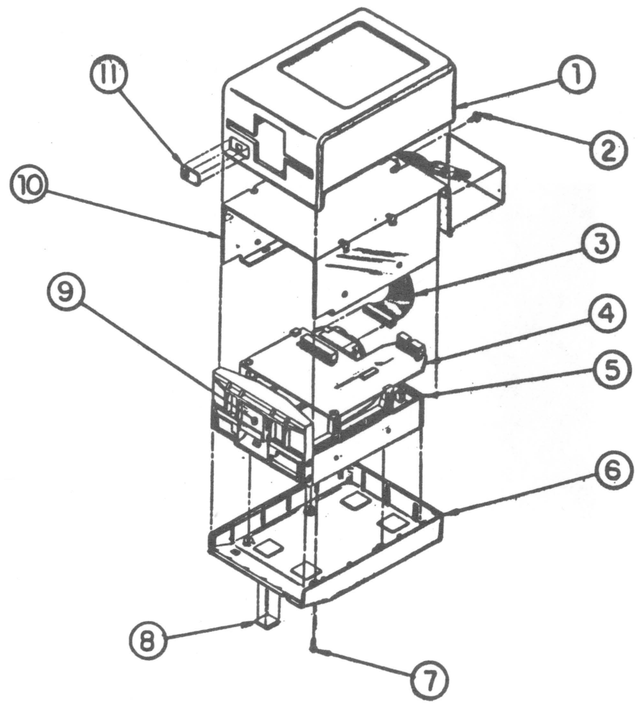
The figures and lists below include all piece parts that can be purchased separately from Apple for the Disk Drive ///, along with their part numbers. These are the only parts available from Apple. Refer to your Apple Service Programs manual for prices.

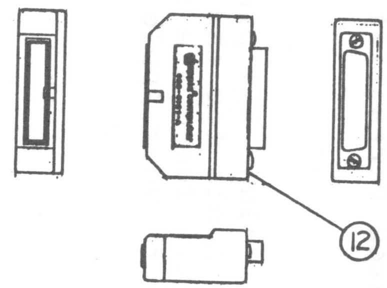
Contents:

NOTE: UNLESS OTHERWISE SPECIFIED

1. MANUAL REFERENCE : LEVEL 1 TECH. PROCEDURES 072-0062

REV.	ZONE	ECO #	REVISION	APPD
A		5493	INITIAL RELEASE	





PARTS LIST HELD BY APPLE SERVICE TRAINING.

METRIC

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TITLE: ILLUSTRATED PARTS LIST DISK DRIVE A3

DRAFT: Tom Anjma 6/84

ORIG. DIV: SERV

SCALE: N/A

SIZE: B

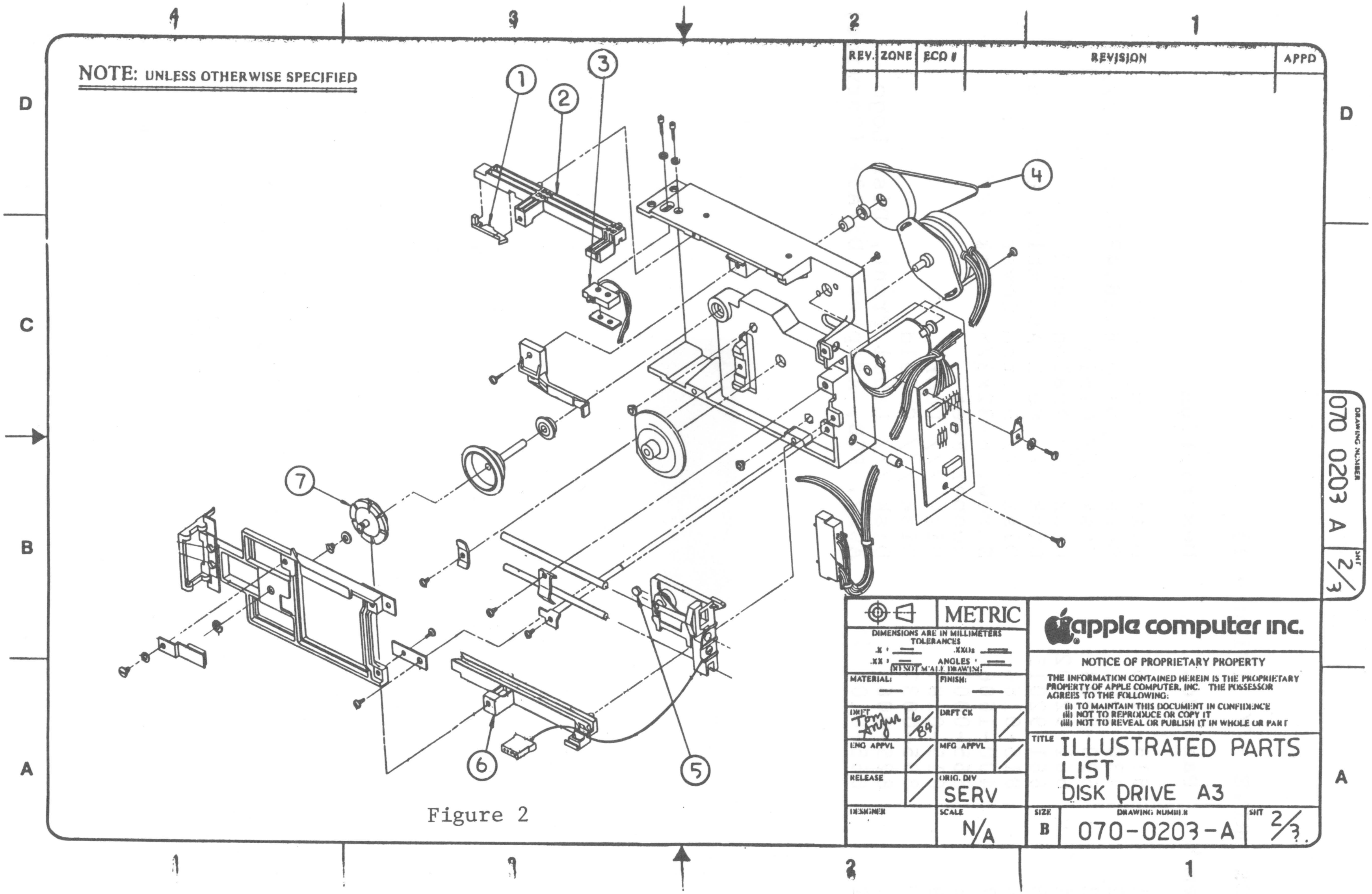
DRAWING NUMBER: 070-0203-A

SHT 1/3

070-0203-A SHT 1/3

DISK DRIVE /// **(Figure 1)**

Item	**Part No.**	**Description**
1	815-0185	Disk /// Top Cover
2	430-1001	Screw Tapping 8x18.437, Disk ///
3	590-0024	Disk /// Cable
4	661-92002	Disk /// Analog Card
5	661-92015	Disk /// Mech Assembly, External
6	815-0186	Disk /// Bottom Cover
7	400-1606	Screw, 6-32x3/8, Disk ///
8	865-0001	Rubber Feet
9	815-0187	Disk /// Door
10	805-0037	Disk /// Shield
11	825-0069	Disk /// Label Front, Disk Logo
12	655-6101	Assy, PCB, Adapter, D3/A3+ (Service)



NOTE: UNLESS OTHERWISE SPECIFIED
REV. ZONE ECO # REVISION APPD
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METRIC
DIMENSIONS ARE IN MILLIMETERS
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MATERIAL:
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DRFT
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TITLE
ILLUSTRATED PARTS LIST
DISK DRIVE A3
SIZE
B
DRAWING NUMBER
070-0203-A
SHT
2/3
070 0203 A

Figure 2

DISK DRIVE /// **(Figure 2)**

Item	**Part No.**	**Description**
1	815-0377	Write Protect Actuator (Alps)
	U815-0073	Write Protect Actuator (Shugart)
2	815-0081	Guide, Diskette (WRT-PRT) Alps
	U815-0072	Guide, Diskette (WRT-PRT) Shugart
3	U705-0005	Write Protect Switch DII-///
4	U880-0002	Disk Drive Belt
5	U815-0064	Load Button
6	815-0080	Guide, Diskette (Cable)
7	U815-0067	Collet Hub

NOTE: UNLESS OTHERWISE SPECIFIED

REV.	ZONE	ECO #	REVISION	APPD	DATE

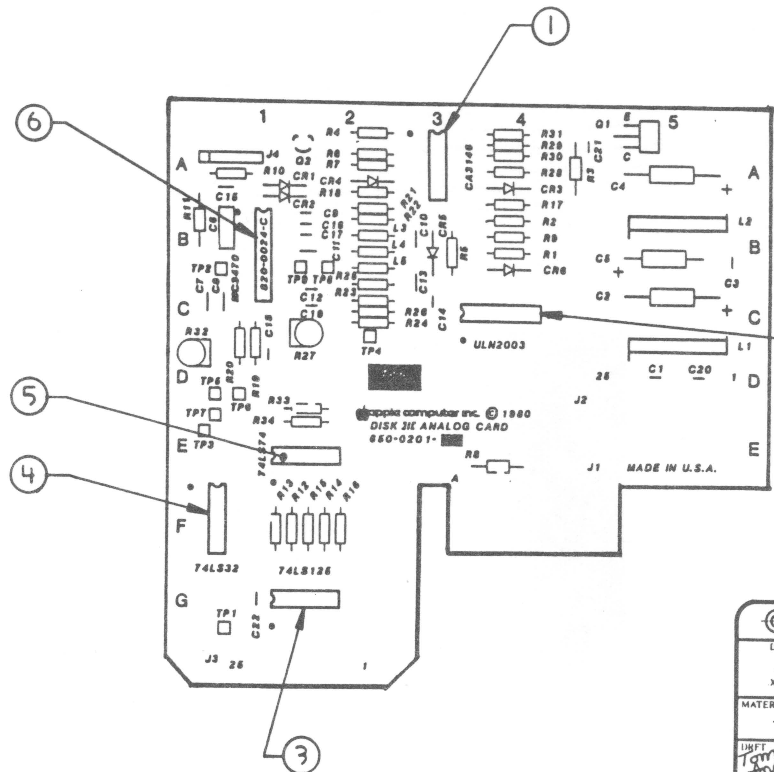


Figure 3

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MATERIAL: — FINISH: —	
DRFT Tom Angun 8/84 · DRFT CK	
ENG APPVL · MFG APPVL	TITLE I.P.L. DISK /// ANALOG CARD
RELEASE · ORIG DIV SERVICE	
DESIGNER · SCALE N/A	SIZE B · DRAWING NUMBER 070-0203-A · SHT 3/3

DRAWING NUMBER 070-0203-A SHT 3/3

apple computer

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A19997

DISK DRIVE /// ANALOG CARD (Figure 3

Item	Part No.	Description
1	352-3146	IC 3146
2	328-2003	IC 2003A
3	306-0125	IC 74LS125
4	306-0032	IC 74LS32
5	306-0074	IC 74LS74
6	356-3470	IC MC3470

ProFile

PROFILE TECHNICAL PROCEDURES

TABLE OF CONTENTS

Section 1 - Apple IIe ProFile Limited Data Recovery Program, Version 2.0

Section 2 - ProFile Exchange Procedures

Section 3 - Illustrated Parts Lists

apple computer inc.

ProFile Technical Procedures

Section 1

Apple /// ProFile Limited Data Recovery

Contents:

A. INTRODUCTION

This ProFile Limited Data Recovery Program is used with Apple /// ProFiles. It attempts to copy customer's files from a damaged ProFile to the exchange unit. Although there is no guarantee that data can be transferred, in most cases data recovery is possible if the ProFile passes the self test after being turned on.

If the ProFile READY light does not come on to a steady state, data cannot be recovered using this program. Special arrangements must be made with Level 2 for data recovery.

The importance of regular backups should be emphasized to the customer. The customer should have a copy of the Backup /// diskette (part number 681 0032). The documentation for this is "Apple /// Backup User's Manual" (part number 030 0381).

CAUTION: Before continuing with this procedure use the "Apple /// Confidence Program" (part number 681 0031) to ensure that the Apple /// is functioning properly. Failure to do this could possibly damage the ProFile!

B. WHAT YOU SHOULD DO FIRST

First run the confidence program and make sure that the Apple /// is functioning properly. Then make a back-up copy of the Recovery Program diskette! You will be using a system with known bad hardware attached to it, so don't take a chance of destroying the software accidentally. Put the original in a safe place.

C. SOFTWARE OVERVIEW

The diskette accompanying this document contains software designed to recover a large portion of data found on a damaged ProFile. In order to use this program the customer's ProFile must complete the power-up cycle, which includes a testing sequence. That is, the red "READY" indicator must be on and steady. If this does not occur, data recovery is not possible.

The program copies data from the customer's ProFile to the exchange unit. If the program has difficulty writing to the Exchange ProFile, it should stop. Something could be wrong with the Exchange unit, so try another Exchange unit. As data is copied, those blocks which the program had problems reading are identified. After the blocks are copied, all further operations are performed on the exchange unit.

The program examines each file to see if any of its blocks were among those which couldn't be copied. A printed record indicates the files that couldn't be copied as being suspect and, most probably, unusable. While this is going on, the master allocation map for the entire ProFile is also being rebuilt. The allocation map tells which blocks are used and which are free for use.

Our testing has shown that of the ProFiles that become "READY", the program is able to recover most all of the customer's data.

D. EQUIPMENT REQUIRED

Recovery Program Diskette
Apple /// System (256k)
Monitor
Compatible Printer
Printer Interface Card (if not using the Silentype printer)
ProFile Interface Card (2 required)
ProFile Interface Cable (2 required)

E. CONFIGURING THE SOFTWARE

The Recovery Program software is configured for two ProFile drivers and the Silentype printer. If you use the Silentype printer no configuration is necessary. If you wish to use a printer which uses the built-in serial port or an interface card, use the System Configuration Program to add the appropriate driver. (Refer to the Standard Device Drivers Manual.) Delete the .PRINTER driver already configured. Whatever printer driver you use must be named **.PRINTER** as the program looks for this name for its output.

Do not under any circumstances, make any changes to either of the two ProFile drivers. These are named **.GOOD** and **.BAD**, and must remain that way for the program to run correctly.

When you have the software properly configured, make another copy and use it as your working diskette. There is really no point in taking the chance of destroying the one you just configured.

F. SETTING UP THE SYSTEM

1. Turn the power off on the Apple /// and remove the cover.

2. If necessary, install an interface card for the printer in the slot for which you configured its driver.

3. Configure the Apple /// with two ProFiles as follows: Install the ProFile interface cards in slots three (3) and four (4). These are the two right-most slots as you look at the Apple from the keyboard side. Seat the cards firmly in the slots.

4. The ProFile Electronic Module contains two circular markers, one red and one green. Place the red marker on the cable connected to the ProFile card in slot 4. Place the green marker on the cable connected to the card in slot 3. (Addition markers are included in the software package.)

   NOTE: You can leave this set-up and whenever you want to use the data recovery procedures all that is necessary it to connect the ProFiles (see next section).

5. Connect the printer and monitor.

G. RUNNING THE PROGRAM

NOTE: Before you running the Limited Data Recovery Program, attach the LED to the Exchange ProFile. (See Section 2 for directions.)

1. Turn on the monitor.

2. Turn on the printer and make sure it is on-line.

3. Connect the (good) Exchange ProFile to the cable marked with the green marker.

4. Connect the customer's ProFile to the cable marked with the red marker.

   CAUTION: Check that the cables are connected correctly or you will copy files from the Exchange ProFile to the customer's, eliminating any chance of saving any files.

5. Connect the power cables to both ProFiles and turn them on.

6. **Wait** until the "READY" lights on both ProFiles show steady red. This will take a minute or so.

7. Place the Recovery Program Diskette in the Apple /// built-in drive.

8. Turn on the Apple /// and the program will start.

9. When the program starts you will see the message:

   Watch the ready light on the EXCHANGE ProFile.
   Please press the RETURN key when you're ready.

   When you press RETURN, the READY light on the Exchange ProFile should flash once, indicating that the cables are connected correctly.

   If the light does not flash, you may have connected the cables incorrectly. Press the ESCAPE key (to prevent the recovery process), check the cables and try again.

10. As a final check, you will see the following displayed:

    Are you sure you want to overwrite PROFILE? (PROFILE is the name of the Exchange ProFile.)

    Enter "Y" if the ready light flashed, or
    ESCAPE if the ready light did not flash:

    Answer yes by entering a **Y** to begin the recovery process.

11. An asterisk (*) in the upper right hand corner of the screen will blink to indicate that the recovery operation is working correctly. During the operation, different messages will appear on the screen to let you know what is happening within the program. The operation can take anywhere from 15 to 30 minutes, depending upon how much data can be recovered.

12. As sections of the program are completed, messages will be listed to the printer.

13. When the program is done, the Apple bell will beep about every five seconds. Press the ESCAPE key to stop the bell and the program.

14. Power down both ProFiles. The exchange unit goes to the customer, and the other unit goes to Level 2.

15. Turn the equipment off, remove the program diskette and put it away.

H. INTERPRETING THE RESULTS

Give your customer the printed results of the data recovery procedures and a copy of how to interpret these results. In the following explanation, examples of the printout are shown in bold face printing. These statements are interpreted as follows:

Apple /// Limited Disk Recovery Program
Results:
Trouble accessing **0 blocks** (a number other than 0 might appear)

All accessible directories are listed below. Individual files which contain problem blocks are also listed.
The resolution of the individual files on the ProFile is shown as a running status, displaying the directory names as they appear on the ProFile. If a file contains one or more "suspect" blocks, its name will appear.

These files are not deleted as they may, in fact, still be partially usable. An example of this would be as ASCII file, such as one created by AppleWriter. An attempt should be made by the customer to access these files. If the attempt results in "unusual" things happening, then delete them.

Block Conflict Report
This message appears if two or more files claim use of the same block .Another pass through the ProFile directories is made to resolve it. Along with this message the directory names are listed on the print-out. Those files which conflict with each other will be listed. An attempt is made to repair the problem. If the conflict is resolved, no further mention is made of the files, otherwise the following message appears: **Unable to repair all block conflict errors. Try your files.**

Summary of Allocation Map Changes
This summarizes the changes made to the master allocation map. This will include the total number of blocks available on the ProFile (**blocks on volume**), the number of blocks in use (**blocks used**), and the number still available (**blocks available**).

Block(s) released from allocation map
A statement will also appear regarding the number of blocks, if any, released from the allocation map. If blocks were released, the original allocation map "thought" that more blocks were in use than really were. The ProFile returned to your customer contains the updated, correct allocation map.

ProFile Technical Procedures

Section 2

ProFile Exchange Procedures

Contents:

INTRODUCTION

When a customer returns a ProFile™ 5 or 10 megabyte hard disk drive for servicing, the unit will be exchanged for a spares kit ProFile. Run the Limited Data Recovery program (described in Section 1) if there is data the customer wishes to try to recover from the old ProFile and record onto the exchange unit.

Exchanging the ProFile consists of removing the cover and rear plates from the customer's ProFile, then placing the customer's rear plates and cover onto the Service Spares Kit (exchange ProFile) unit.

MATERIALS REQUIRED

Medium Phillips screwdriver
Protective pad

UNPACKING THE SPARES KIT

1. Carefully remove the spares kit from its packaging.

2. A ProFile cover marked "SHIPPING FIXTURE" is attached to the spares kit ProFile. Remove this cover from the ProFile.

3. Verify that all modules are present, all connections are proper, and that there are no loose or broken wires or foreign materials.

4. Keep the cover and shipping materials for use later.

CAUTION: The ProFile is a mechanical device with motors and moving parts. Rough handling -- such as dropping the drive, sharply jarring it, or allowing heavy objects to fall on it -- can cause a malfunction. Whenever it is necessary to turn the ProFile over, be sure to rest it on a protective pad.

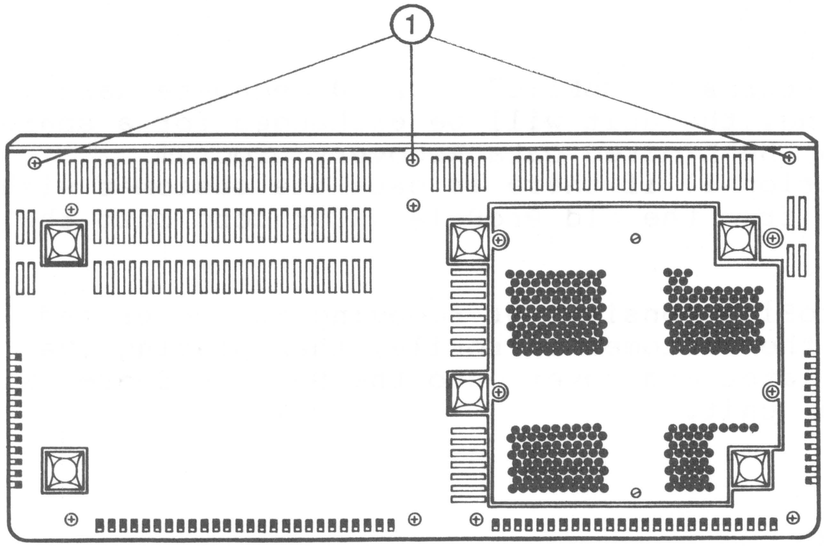


FIGURE 1

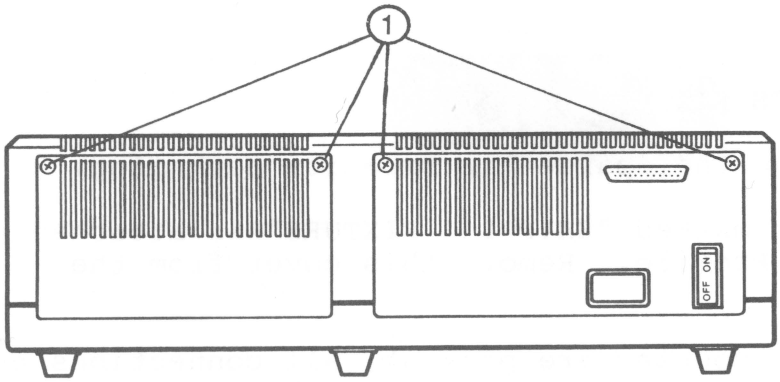


FIGURE 2

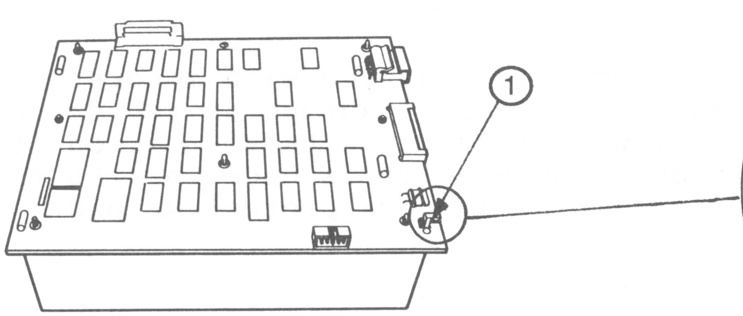


FIGURE 3

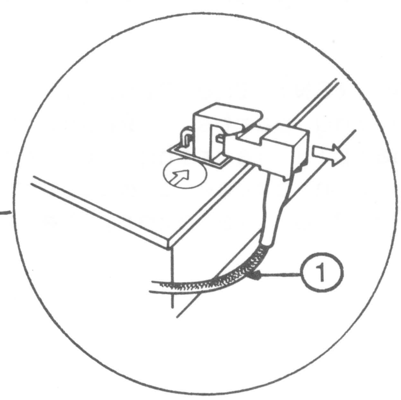


FIGURE 4

REMOVING THE COVER

1. Be sure the customer's ProFile is turned off. Disconnect the power cord and ribbon cable from the rear of the Profile.

2. Turn the ProFile over, lay it on the protective pad, and remove the three Phillips-head screws from under the front panel (Figure 1, #1).

3. Turn the ProFile right side up; remove the four screws from the two plates on its back (Figure 2, #1).

4. Lift the cover off carefully and rest it on the far side of the case, taking care not to pull on the LED cable.

5. Unplug the LED cable from its socket on the controller board (Figures 3 and 4, #1).

REPLACING THE COVER AND REAR PLATES

1. Attach the customer's LED cable to its connector on the controller card of the exchange unit (Figure 3, #1). Make sure the LED cable exits down and away from the card (Figure 4, #1).

2. Attach the customer's two rear plates to the exchange unit using the four screws. Do not tighten the screws at this time (Figure 2, #1). **NOTE:** The serial number is stamped on one of the rear plates and must be transferred to the ProFile which the customer will keep.

3. Place the customer's ProFile cover onto the exchange module. (Hint: The four slots on the back of the cover fit between the inner and outer rear plates. Line up the back first; then pull the cover gently forward and down. Check around the cover to make sure the LED cable isn't caught between the cover and the base.)

4. Tighten the four rear-plate screws.

5. Turn the ProFile over and replace the three screws on the bottom front edge (Figure 1, #1).

6. Turn the ProFile right side up. Reinstall the power cord and ribbon cable.

7. Attach the ProFile cover marked "SHIPPING FIXTURE" to the unit to be returned for servicing.

SUMMARY OF PROCEDURES (CHECKLIST)

When a customer brings in a non-working ProFile that must be exchanged, follow the steps outlined below.

Run the Limited Data Recovery program with an Apple IIe:

___ Turn on monitor and printer; be sure printer is on-line.

___ Connect exchange ProFile (use slot 3 for the Interface card).

___ Connect customer's ProFile (use slot 4 for the Interface card).

___ Turn on Apple IIe and run the Limited Data Recovery program (see Section 1 under this tab).

___ Power down and disconnect both ProFiles.

Replace the customer's ProFile with the exchange ProFile:

___ Remove both rear plates from the customer's ProFile.

___ Remove the cover from the customer's ProFile.

___ Unplug the LED cables from the controller cards of both ProFiles. Attach the customer's LED cable to the appropriate connector on the controller card of the exchange ProFile.

___ Transfer the two rear plates from the customer's ProFile onto the exchange ProFile. Note that the serial number is on one of these plates.

___ Attach the customer's cover to the exchange ProFile, fitting it into place over the two rear plates.

___ Transfer the ProFile cover marked "SHIPPING FIXTURE" onto the unit to be repaired.

___ Pack the repair unit in the spares kit packaging.

___ Complete all shipping documentation.

ProFile Technical Procedures

Section 3

Illustrated Parts List

The figures and lists below include all piece parts that can be purchased separately from Apple for the ProFile, along with their part numbers. These are the only parts available from Apple. Refer to your Apple Service Programs manual for prices.

NOTE: For ProFile interface cards for Apple II/II+, Apple IIe and Apple ///, see parts list section for appropriate computer.

Contents:

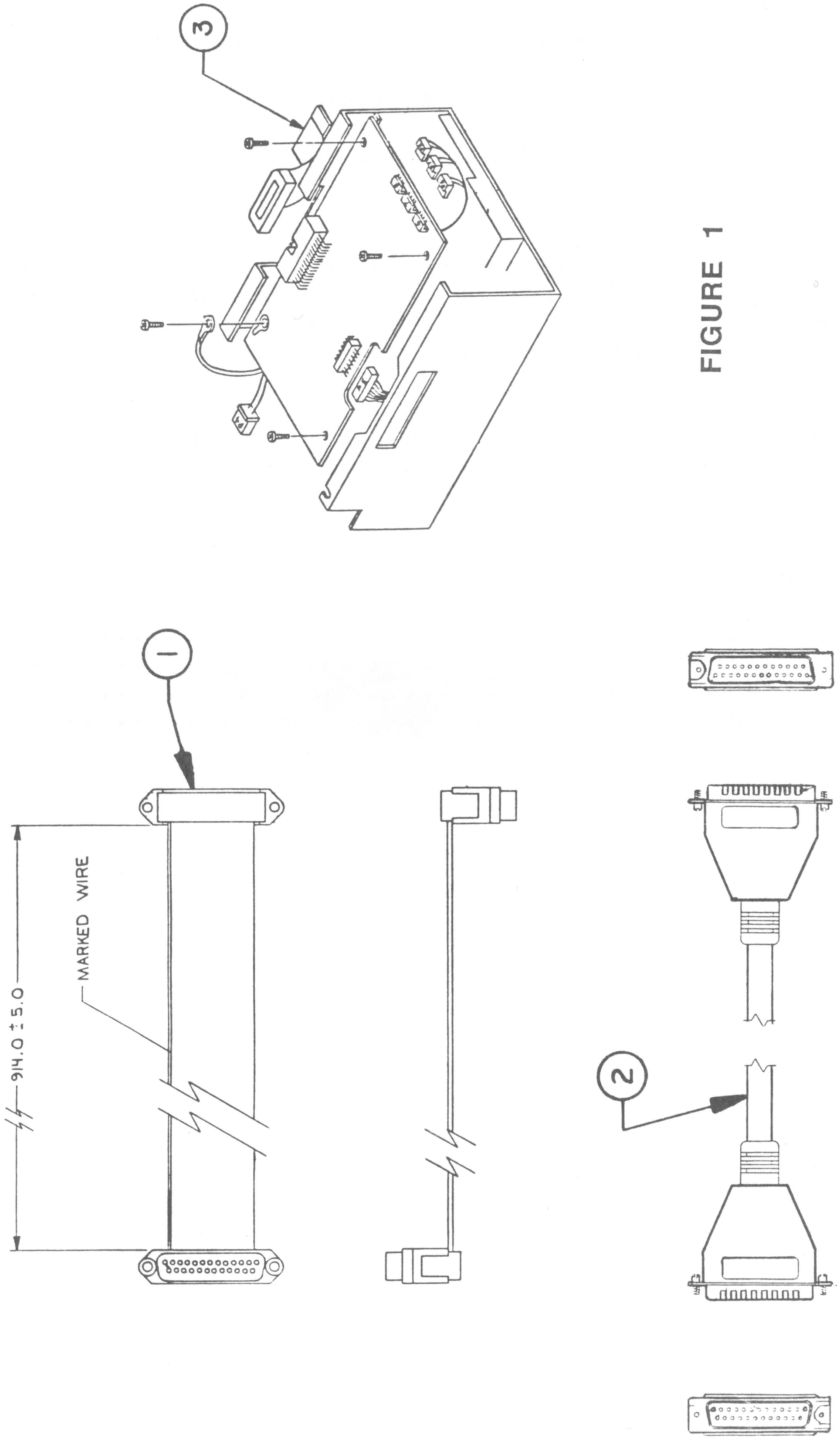


FIGURE 1

PROFILE - CABLES (Figure 1)

Item	Part No.	Description
1	590-0046	Cable I/O
2	590-0202	Cable, External
3	590-0048	Cable, Controller to Analog

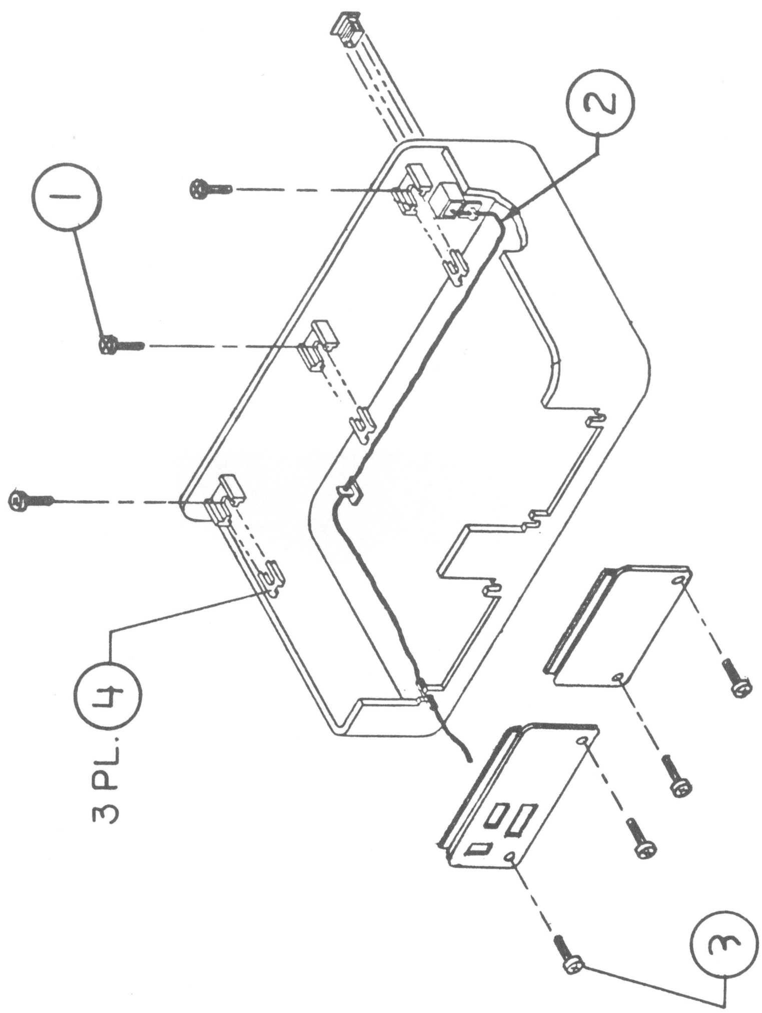


FIGURE 2

PROFILE - PIECE PARTS (Figure 2)

Item	Part No.	Description
1	430-1001	Screw, Tapping, 8-18 x 0.437 PN CRS
2	590-0047	Cable LED
3	403-1606	Screw, 6-32 x 3/8 Panhead
4	835-0005	Nut Speed "J"

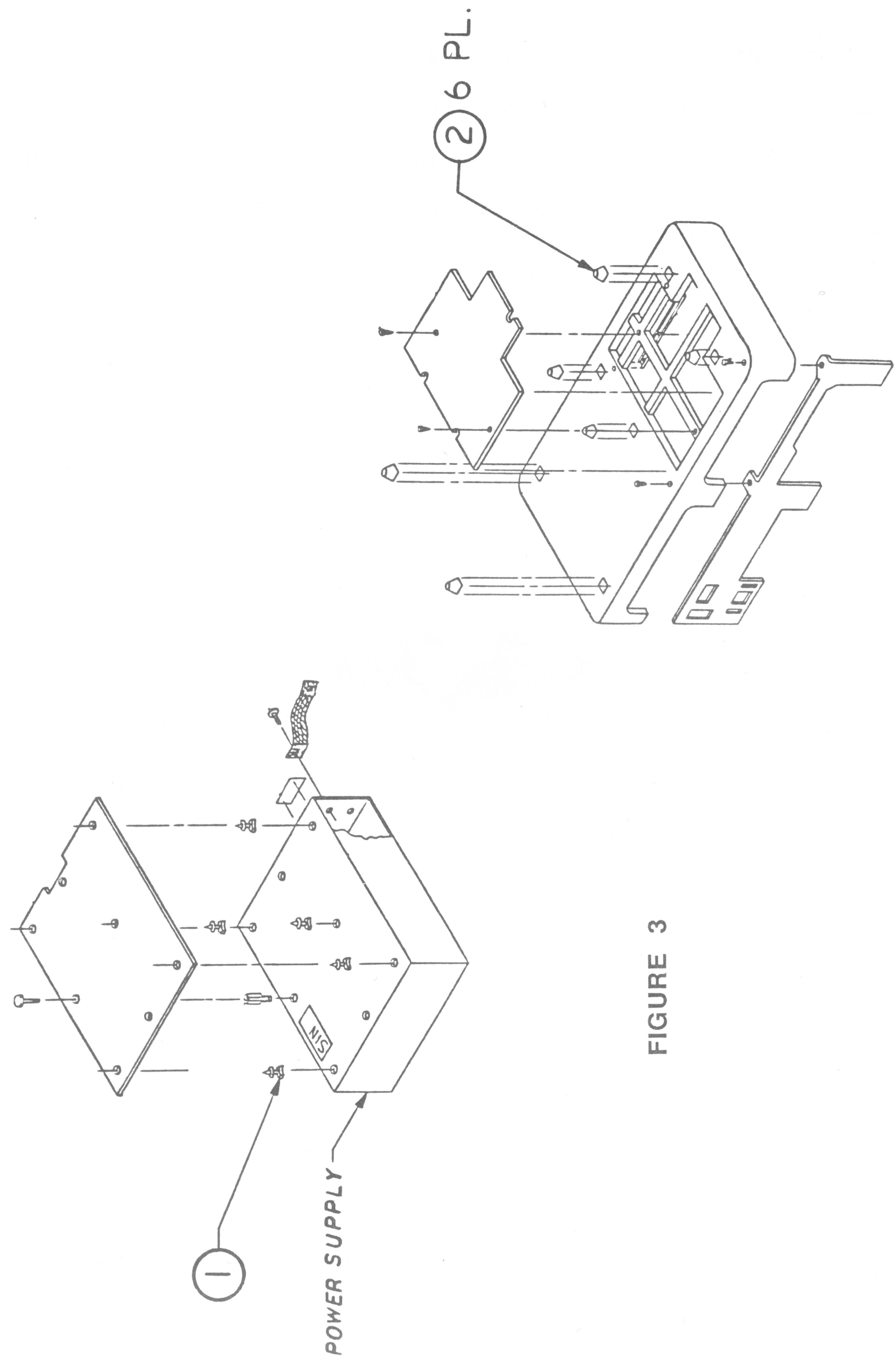


FIGURE 3

PROFILE - MISCELLANEOUS PARTS (Figure 3)

Item	Part No.	Description
1	860-0200	Standoff Plastic
2	865-0005	Foot, .52HT SQ

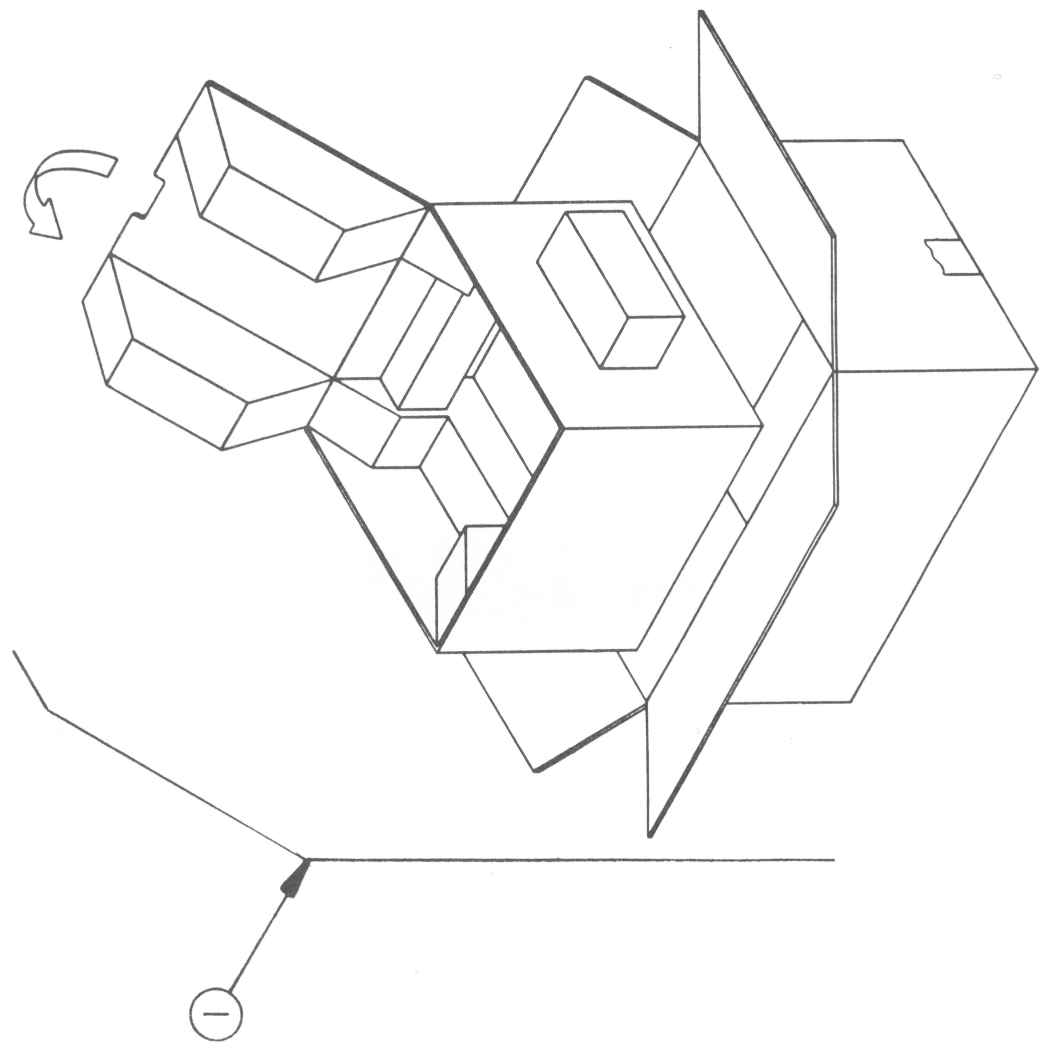


FIGURE 4

PROFILE - PACKAGING (Figure 4)

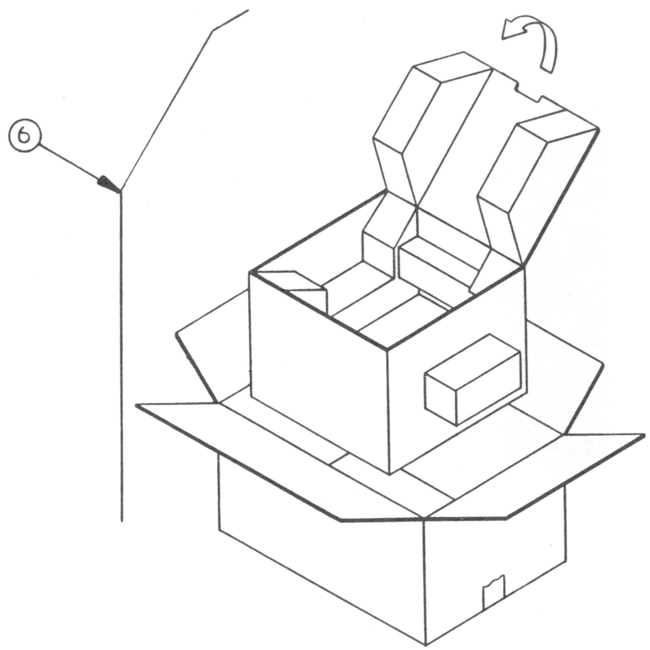
Item	Part No.	Description
1	602-0041	ProFile Packaging, Svc. Level I

PROFILE

Item	Part No.	Description
2	590-0047	Cable LED
5	112-0107	Resistor Array 8 x 100 ohm
7	835-0005	Nut Speed "J"
10	430-1001	Screw, Tapping, 8-18 x 0.437
11	403-1606	Screw, 6-32 x 3/8 Panhead

NOTE: UNLESS OTHERWISE SPECIFIED

REV.	ZONE	ECO #	REVISION	APPD	DATE

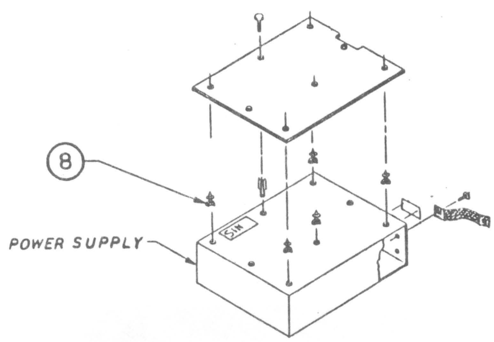


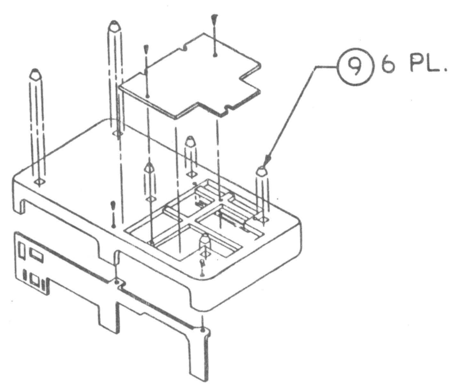
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ENG APPVL MFG APPVL	
RELEASE ORIG. DIV SERVICE	
DESIGNER SCALE NONE	SIZE B DRAWING NUMBER 070-0181-A SHT 7/7

DRAWING NUMBER 070-0181-A SHT 7/7

PROFILE

Item	Part No.	Description
6	602-0068	ProFile Packaging, Svc. Level I


8
POWER SUPPLY


9 6 PL.

PROFILE

Item	Part No.	Description
8	860-0020	Standoff Plastic
9	865-0005	Foot, .52HT SQ

Duodisk

TABLE OF CONTENTS

DuoDisk Technical Procedures

Section 1

Troubleshooting

Contents:

General Information

The Apple® DuoDisk™ disk drive is effectively two disk drives in one case. Both drives are attached to a single analog card, with the drive on the left side defined as Drive 1.

There are four main modules which can be replaced: the interface card, the interface cable, the analog card, and the mechanical assembly. Chip swapping on the analog card is recommended before replacing the card.

Using the Troubleshooting Flowchart

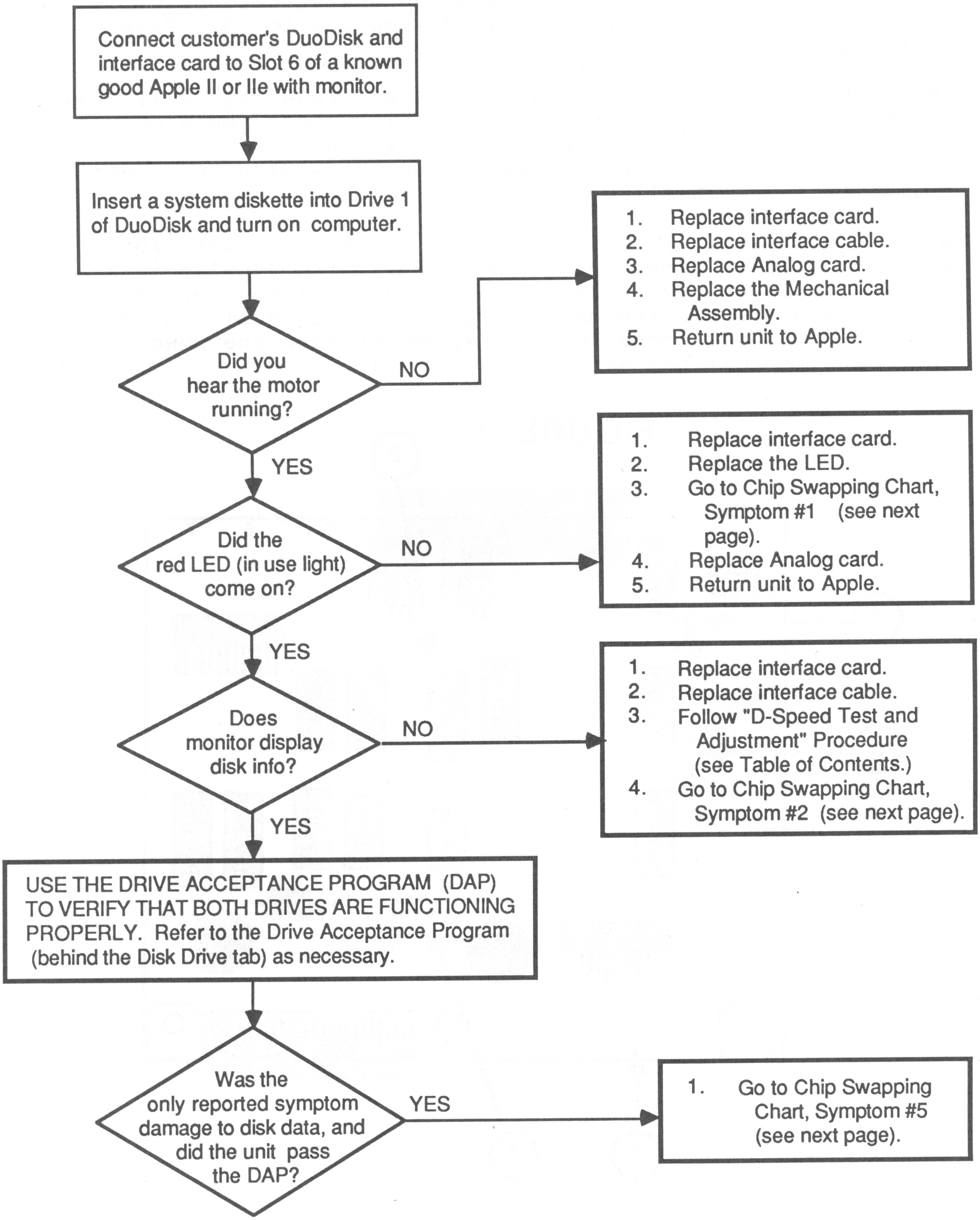
Whenever a customer brings in a presumably bad Duodisk, use the flowchart on the following page to begin troubleshooting. Begin with the box in the upper left corner of the page. When you get to one of the answer boxes (boxes with dark borders), swap the modules/components, one at a time, in the order in which they are listed. Each time you swap out a module/component, turn on the computer and see if you can boot a system diskette (preferably the DOS 3.3 System Master).

Remember, once you are able to boot a diskette, be sure to run the Drive Acceptance Program (P/N 077-8101A) performing any adjustments necessary. Reinstall the customer's modules/components, one at a time, testing after each exchange to isolate the bad part(s).

NOTE: There is a chance for data on the diskette to be lost in operating the DuoDisk. This can occur in attempting the "Open Apple CTL-Reset" technique for rebooting, or when using software with certain copyright protection schemes. If a unit exhibits this problem and passes the Drive Acceptance Program, check the analog board. Analog boards with part numbers 676-[]101 and 676-[]102 may have this problem. The fix is to carefully identify and cut two capacitors off the board. The capacitors are labeled C29 and C30 in zones B1 and A1 (refer to the DuoDisk Analog Card Chip Swapping Chart and Figure 1, #4 and #5). Use small wire clippers or simply jiggle the capacitors to snap the connections.

NOTE: If you do not know how to connect the DuoDisk to an Apple computer, refer to the DuoDisk Owner's Manual for instructions.

DUODISK TROUBLESHOOTING FLOWCHART



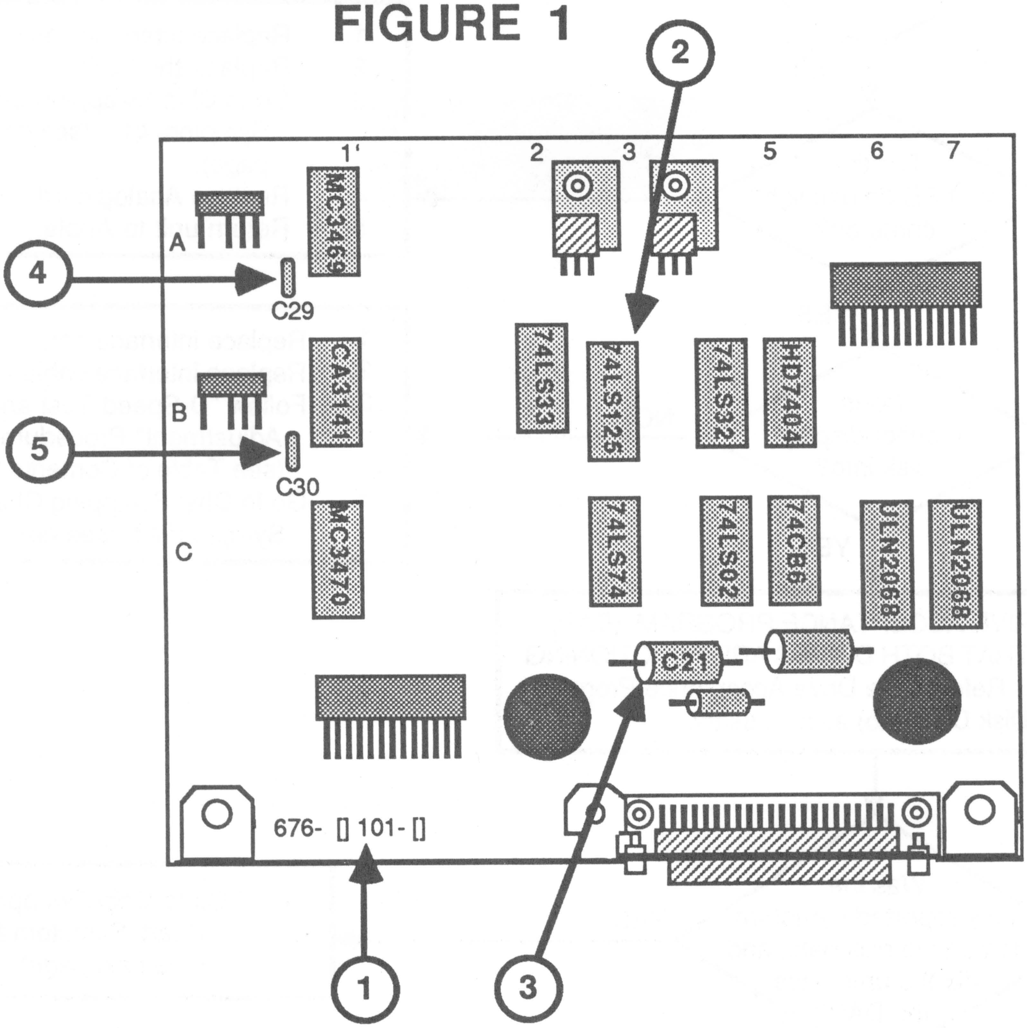
DuoDisk Analog Card Chip Swapping Chart

The chip swapping chart on the opposite page can be used for drive 1 and/or drive 2. To access the analog card chips, remove the DuoDisk cover and shield (see Section 3, "Take-Apart").

IMPORTANT: Locate the engineering number (see Figure 1, #1). Symptoms 1 through 4 on the chip swapping chart apply only to DuoDisk analog cards with Engineering # 676-[]101. Symptom 5 on the chart applies to DuoDisk analog cards with Engineering # 676-[]101 or 676-[]102.

Before replacing any chips carefully inspect the card for melted or broken components, particularly the 74LS125 (see Figure 1, #2) and C21 (see Figure 1, #3). If you notice fuzz on the card, return the card to Apple. This usually means that the card was connected to a computer with the power on, and capacitor C21 has exploded.

FIGURE 1



Here's What To Do

Identify the symptom and replace the related chips, one at a time, in the order in which they are listed. Each time you replace a chip, turn the computer back on to see if the problem is gone. If the problem still exists after you have replaced all the chips related to the problem, go to the next step listed in the answer box (where you left off) on the troubleshooting flowchart.

	Symptom	Location	Defective Chip Type
1.	Motor runs, but LED is off	A1	3469
		B4	74LS32
		B5	7407
	Won't boot		
2.	Motor and LED are on	B1	CA3141
		B3	74LS125
		A1	MC3469
		C1	MC3470
	Won't boot	B2	74LS33
		B5	7407
		C3	74LS74
		C4	74LS02
		C6	ULN2068
		C7	ULN2068
3.	Drive reads but does not write	A1	MC3469
		B1	CA3141
		B2	74LS33
		B3	74LS125
		C5	74C86
		B5	7407
4.	Drive writes when diskettes are write protected	A1	MC3469
5.	Data on disk is damaged when using "Open Apple-CTL-Reset" for rebooting, or when using software with certain copyright protection schemes. <u>AND</u>: **Unit passes DAP.** <u>AND</u>: Analog board PN is 676-[]101 or 676-[]102.	A1	Capacitor C29
		B1	Capacitor C30 (remove both, do not replace)

apple computer

Duodisk Technical Procedures

Section 2

Adjustments

Contents:

D-SPEED TEST AND ADJUSTMENT

Required Materials and Set Up

1. Set up a known good Apple][or //e.
2. Connect a known good disk drive and interface card to slot 6 of the computer. You do not have to use another DuoDisk.

   NOTE: If you do not know how to do this, refer to the Apple // owner's manual.

3. Install a known good DuoDisk interface card into slot 5 of the computer.
4. Connect the DuoDisk to be tested to the interface card in slot 5.
5. Obtain the following materials:

   a) Disk Alignment Aid (P/N 077-0031).

   b) A unprotected blank (scratch) diskette.

   c) A small (jeweler's) flatblade screwdriver.

The Test:

1. When the system is set up, place the blank diskette in drive one (left side) of the DuoDisk.
2. Place the Disk Alignment Aid in the known good drive (connected to slot 6) and turn on the computer. If you're using the Apple //e, make sure that the CAPS LOCK key is down.
3. When the menu comes up, **SET TARGET DISK** will be highlighted. Type **A** to accept it.

   NOTE: If a menu selection is highlighted, typing A (accept) accepts the entry. Typing **S** (skip) causes the cursor to go to the next menu selection.

4. The display will prompt you to select the slot and the drive. To change the default (slot 6) to slot 5, do the following:

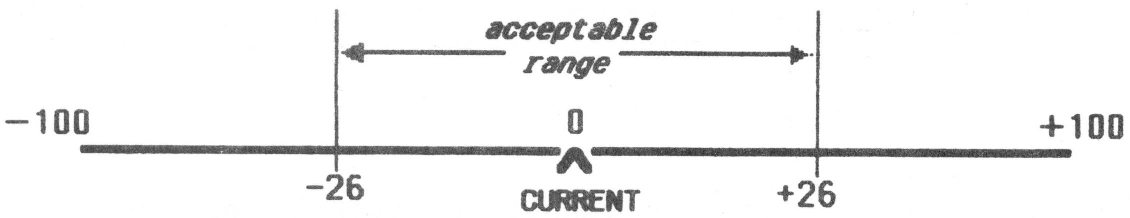
   Type **A**. A **6** now appears under the word ALTERNATE.
   Type **S**. The **6** (above) will change to a **5**.
   Type **A**. This accepts slot 5.

5. Press <ESCAPE> to return to the main menu.

6. To select the **D-Speed** test, type **S** (three times) to move the cursor to the D-Speed option, then type A to accept this option.

7. The screen will warn you that the test will write on the diskette in slot 5, drive 1. Make sure that there is an unprotected blank diskette in drive 1 of the DuoDisk and type **A** to start the test.

   The display will appear similar to the diagram shown below. The current marker (/\) in the middle indicates the actual speed of the drive. You should see constantly changing numbers just below the current marker. The acceptable range is +26 to -26. (See diagram below.)



IF:

1. The D-Speed display does not remain on the screen, or

2. You get an ERROR message, or

3. You do not see constantly changing numbers located below the current marker,

THEN PERFORM THESE STEPS, starting with step 1:

1. Go to the Chip Swapping Chart (see Contents) and replace the chips related to Symptom #2, and try the D-Speed test again.

2. Replace the analog card, and try the test again.

3. Replace the mechanical assembly, try the D-Speed test again.

8. Is the drive speed within range (+26 to -26)?

   Yes -- Press <ESCAPE> to stop the test. Go to Step 13.

   No -- Continue with the next step.

9. Locate the D-Speed adjustment hole under the drive being tested so that the adjustment can be made. The adjustment screw is located inside the hole.

   NOTE: When making the D-Speed adjustment, keep the DuoDisk flat.

10. The adjustment is extremely sensitive, so very slowly turn the adjustment screw. The indicator on the screen moves back and forth, showing changes of the speed.

11. Set the speed between -5 and 0. Allow the DuoDisk to run for 128 passes (indicated at the top of the screen), and confirm that the average D-Speed is between -5 and 0. Re-adjust if necessary.

12. Is the D-Speed now within range?

    Yes -- Drive 1: Press <ESCAPE> to return to the main menu. Continue on with the next step.

    Drive 2: Go to step 17.

    No -- If the D-Speed cannot be properly adjusted, return the DuoDisk to Apple.

13. Type **S**, then **A** to select SET TARGET DISK so that the other drive can be selected for testing.

14. Select slot 5, drive 2 by typing **SAA**.

15. Press **<ESCAPE>** to return to the menu.

16. Put the blank diskette into drive 2 of the DuoDisk and repeat steps 6 through 12 to test and adjust the D-Speed.

17. Use the Drive Acceptance Program (DAP) to verify that the DuoDisk is functioning properly. Refer to the Drive Acceptance Program Technical Procedure (behind the Disk Drive tab) as necessary.

DuoDisk Technical Procedures

Section 3

Take-Apart

Contents:

Removing the Cover and Shield

NOTE: A Phillips screwdriver is required.

1. Turn the power off on the Apple and remove any diskette(s) which might be in the DuoDisk.

2. Remove any screws securing the DuoDisk cable connector and unplug it from the back of the DuoDisk.

3. Remove the two screws at the back of the unit and remove the cover.

4. Remove the top screw securing the shield to drive 1 (with the ground strap) and remove the shield.

5. Remove the screw securing the ground strap to the rear of drive 1.

6. Remove the top screws securing the shield to drive 2 and remove the shield.

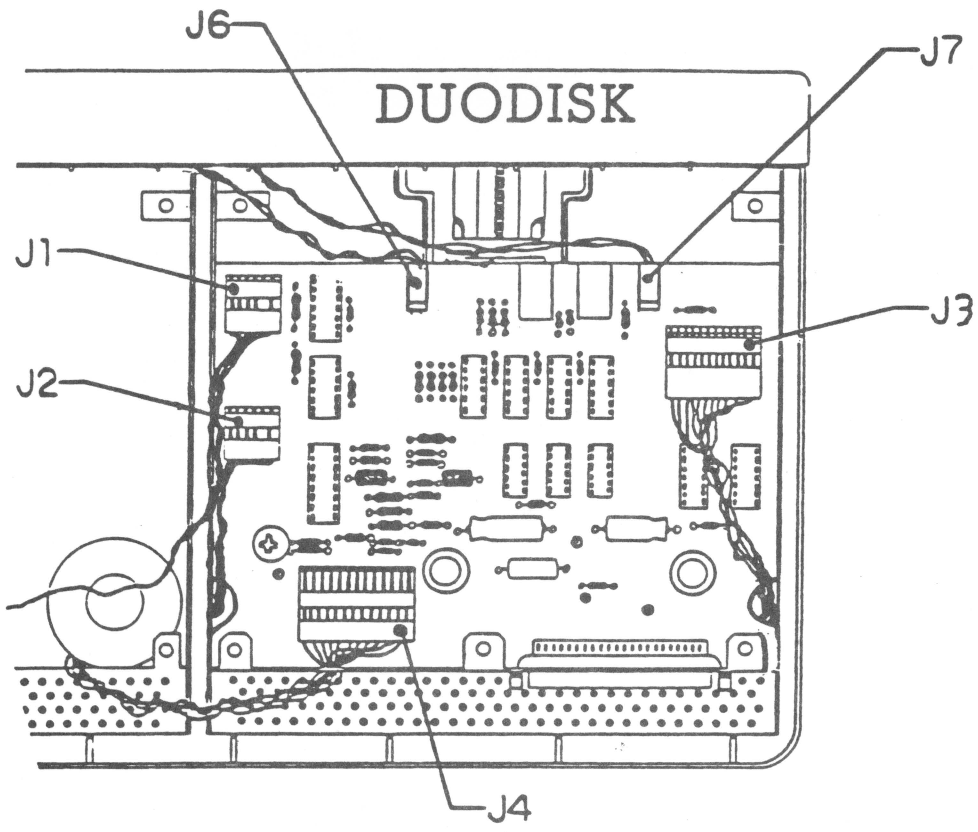


FIGURE 1

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REMOVING THE ANALOG CARD AND MECHANICAL ASSEMBLY

Removing the Analog Card

1. Remove both Disk Head connectors (Fig. 1, J1 and J2). Notice the position of the shrink tubing on the wire coming from drive 2.

   NOTE: Always pull on the connector, not the wire.

2. Remove stepper motor connectors (Fig. 1, J4 and J3).

3. Remove the two LED connectors (Fig. 1, J6 and J7). Be sure to pull on the connector and not the wires.

4. Remove the two screws and the analog card.

Removing the Mechanical Assembly

NOTE: If removing the drive 1 mechanical assembly, remove the screw securing the ground strap and the partial shield covering it. If working on drive 2, remove the Disk Head connector from the clip on the side.

5. Place the DuoDisk top down and remove the four screws from the mechanical assembly you want to remove.

6. Holding the assembly in place, turn the DuoDisk right side up.

7. Lift up and back on the bottom shield, which houses the assembly, and remove it.

   CAUTION: When removing the assembly in the next step, do not touch the bottom of the assembly, as there are parts which could be damaged.

8. Remove the assembly from the shield by removing the two outside screws (one on each side) and pulling the assembly, by the front plastic, up and away from the shield. If necessary, spread the shield slightly to allow the assembly to slide out.

apple computer

REPLACING THE MECHANICAL ASSEMBLY AND ANALOG CARD

Replacing the Mechanical Assembly

CAUTION: Do not touch the bottom of the assembly as there are parts which could be damaged.

1. Hold the shield in your left hand, open side up. Hold the mechanical assembly in your right hand.

2. Hold the mechanical assembly at an angle and slide it back until the motor touches the back of the shield.

3. Lower the front end of the mechanical assembly while sliding it back. It might be necessary to slightly spread the shield to allow the assembly to pass the analog card guides (ridges) on each side.

4. Make sure the wires from the stepper motor on drive 1 (on the right) <u>wrap around the back of the motor</u> and fit in the space between the motor and the shield.

   The wires from the stepper motor on drive 2 lie over the back of the shield. The Disk Head wires wrap behind the motor and clip along the side.

5. Replace the screw on each side of the metal shield.

6. Close the drive door and position the case with the back facing you.

7. Holding the assembly at the back, slide it forward into the case and guide the drive door into the case slot.

8. While holding the assembly in place, turn the DuoDisk over and replace the four screws on the bottom of the case to secure the assembly.

9. Replace the partial shield above the mechanical assembly on drive 1.

Replacing the Analog Card

10. Lift the six connectors away from the mechanical assembly on drive 1 and position the analog card with the front through the guides.

11. Route the Disk Head wires (Fig. 1, J1) and stepper motor wires (Fig. 1, J3) through their respective cutouts.

12. Secure the two screws to the analog card.

13. Reconnect the stepper motor connector (Fig. 1, J3) for drive 1. If there is no key to indicate correct orientation, the side with "A2" should be face up. (There will be no wires for pins 1 and 2.)

14. Feed the drive 2 stepper motor cable through the cutout at the back of the shield and connect it (Fig. 1, J4).

15. Thread the Disk Head connector for drive 2 (Fig.1, J2) through the cutouts in the shields and connect it. Make sure the shrink tubing fits in the cutouts.

    NOTE: The connector will fit on either way, so make sure that each pin of the fixture is aligned with a metal tab within the connector.

16. Connect Disk Head connector for drive 1 (Fig. 1, J1).

    NOTE: The connector will fit on either way, so make sure that each pin of the fixture is aligned with a metal tab within the connector.

17. Reconnect the LED connector for drive 2 (Fig. 1, J6) and for drive 1 (Fig. 1, J7).

REPLACING THE SHIELD AND COVER

1. Position the DuoDisk with the back facing you.

2. Replace the metal shield on drive 2, fitting the front prongs into place. Make sure that the stepper motor cable on drive 2 fits through the semicircular cutout at the back of the shield. The Head cable fits through the small opening on the side next to drive 1. Check that the shrink tubing for these wires is in place.

3. Replace the two screws on the drive 2 shield.

4. Fasten the ground strap to the back of the analog card.

5. Replace the shield on drive 1.

6. Slide the top cover into place and replace the two screws at the back of the case.

DuoDisk Technical Procedures

Section 4

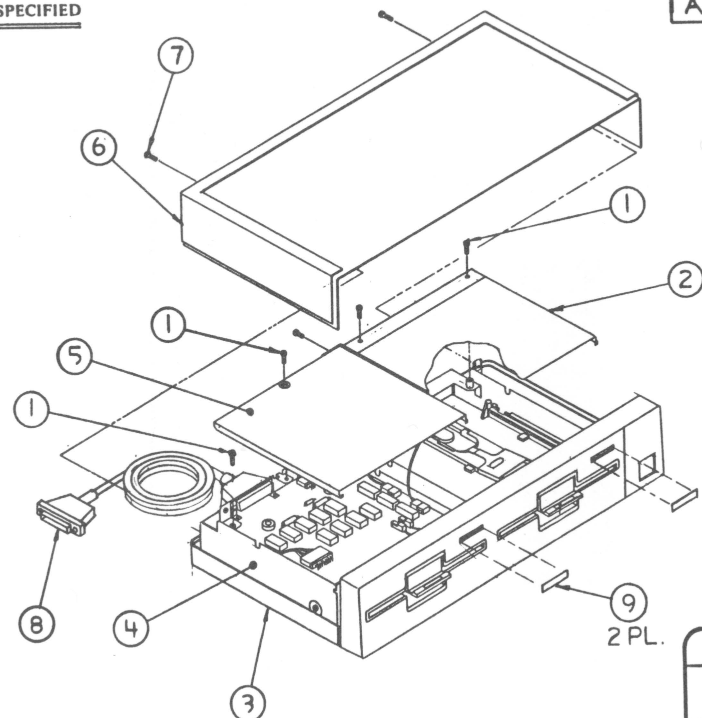
Illustrated Parts List

The figures and lists below include all piece parts that can be purchased separately from Apple for the DuoDisk, along with their part numbers. These are the only parts available from Apple. Refer to your Apple Service Programs manual for prices.

Contents:

REV.	ZONE	ECO #	REVISION	APPD
A		S493	INITIAL RELEASE	

NOTE: UNLESS OTHERWISE SPECIFIED



PARTS LIST HELD BY APPLE SERVICE TRAINING.

METRIC

DIMENSIONS ARE IN MILLIMETERS
TOLERANCES
.X ± — .XXO ± —
.XX ± — ANGLES ± —
DO NOT SCALE DRAWING

MATERIAL:	FINISH:
DRFT Tom Angun 8/84	DRFT CK
ENG APPVL	MFG APPVL
RELEASE	ORIG. DIV SERV
DESIGNER	SCALE N/A

apple computer inc.

TITLE ILLUSTRATED PARTS LIST DUODISK

SIZE	DRAWING NUMBER	SHT
B	070-0204-A	1/3

DRAWING NUMBER 070-0204-A SHT 1/3

DUODISK (Figure 1)

Item	Part No.	Description
1	400-1604	Screw, 6-32x1/4
2	805-5002	Shield, Top, Drive 2
3	676-5101	Subassembly, Bottom Cover
4	805-5000	Shield, DuoDisk
5	805-5001	Shield, Top, Drive 1
6	676-5103	Top Cover Assembly
7	415-1410	Screw, M3.5x6x10MM. PN
8	590-0114	Duodisk Cable
9	825-0548	Label, Drive #, Uni/DuoDisk

REV.	ZONE	ECO #	REVISION	APPD

NOTE: UNLESS OTHERWISE SPECIFIED

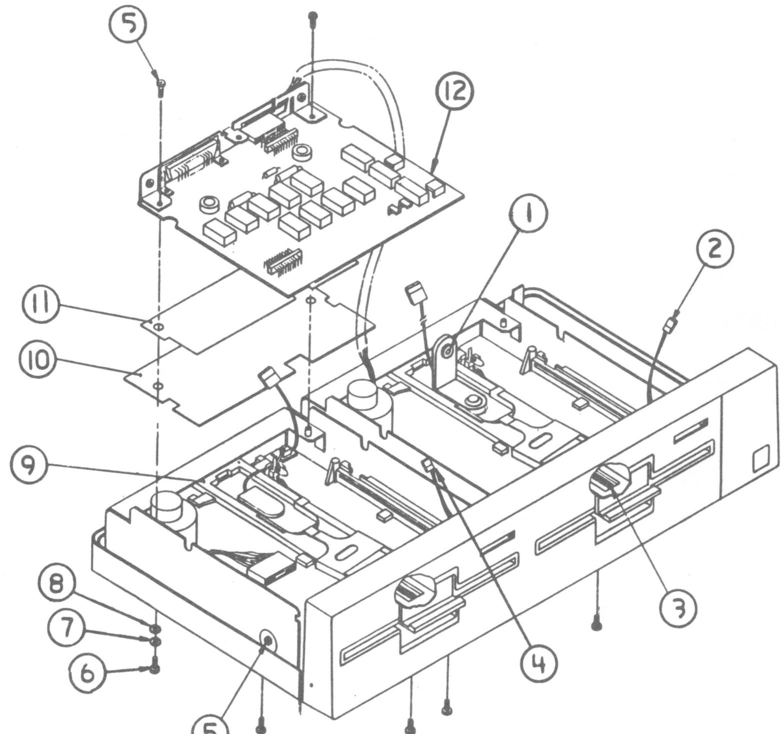


Figure 2

METRIC	apple computer inc.
DIMENSIONS ARE IN MILLIMETERS TOLERANCES .X ± .XX ± .XXX ± ANGLES ± DO NOT SCALE DRAWING	NOTICE OF PROPRIETARY PROPERTY THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE COMPUTER, INC. THE POSSESSOR AGREES TO THE FOLLOWING: (i) TO MAINTAIN THIS DOCUMENT IN CONFIDENCE (ii) NOT TO REPRODUCE OR COPY IT (iii) NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART
MATERIAL: FINISH:	
DRFT Tom Arigua 6/84 DRFT CK	TITLE ILLUSTRATED PARTS LIST DUODISK
ENG APPVL MFG APPVL	
RELEASE ORIG. DIV SERV	
DESIGNER SCALE N/A	SIZE B DRAWING NUMBER 070-0204 -A SHT 2/3.

DUODISK (Figure 1)

Item	Part No.	Description
1	400-1604	Screw, 6-32x1/4
2	805-5002	Shield, Top, Drive 2
3	676-5101	Subassembly, Bottom Cover
4	805-5000	Shield, Duodisk
5	805-5001	Shield, Top, Drive 1
6	676-5103	Top Cover Assembly
7	415-1410	Screw, M3.5x6x10MM. PN
8	590-0114	Duodisk Cable

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REV.	ZONE	ECO #	REVISION	APPD

NOTE: UNLESS OTHERWISE SPECIFIED

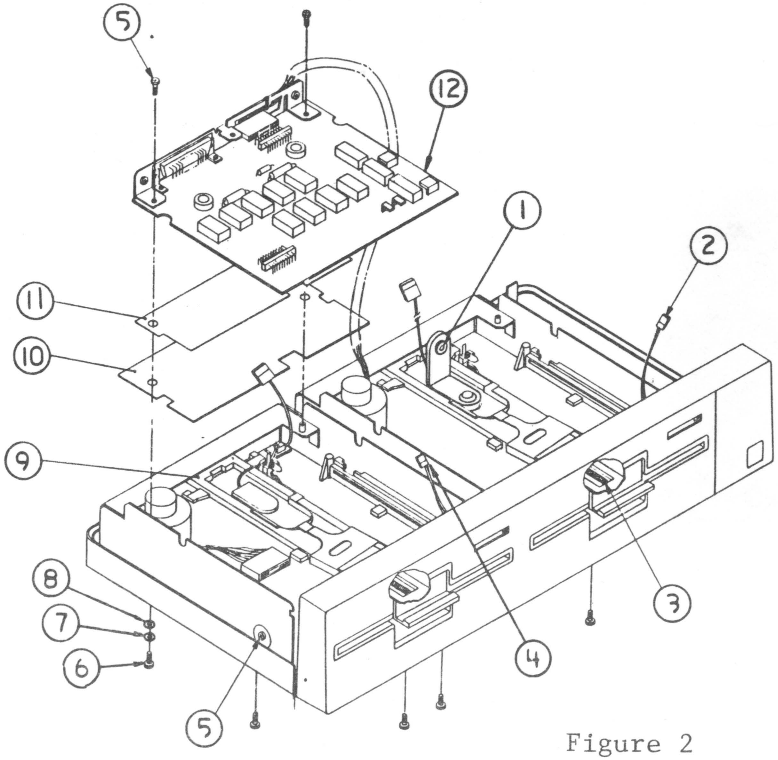


Figure 2

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METRIC

DIMENSIONS ARE IN MILLIMETERS
TOLERANCES
.X ± ___ .XXX± ___
.XX ± ___ ANGLES ± ___
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ENG APPVL	MFG APPVL
RELEASE	ORIG. DIV SERV
DESIGNER	SCALE N/A

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TITLE ILLUSTRATED PARTS LIST DUODISK

SIZE	DRAWING NUMBER	SHT
B	070-0204 -A	2/3

DUODISK (Figure 2)

1	U815-0064	Load Button
2	590-0223	Assembly, Cable, LED, D2
3	870-0023	Spring
4	590-0140	Assembly, Cable, LED, D1
5	400-1604	Screw, 6-32x1/4
6	407-1605	Screw, 6-32x5/16 Pan Head ‖
7	860-0242	Washer, M3.5x4.0 I.D.x7.0 O.D.
8	860-0053	Washer, Split Lock Metric, M3.5
9	661-72128	Uni/DuoDisk Disk Mech. Assembly ‖
10	805-5028	Shield Plate
11	805-5029	Seat Insulating
12	661-92130	DuoDisk Analog Card

070-0204-A SHT 3/3

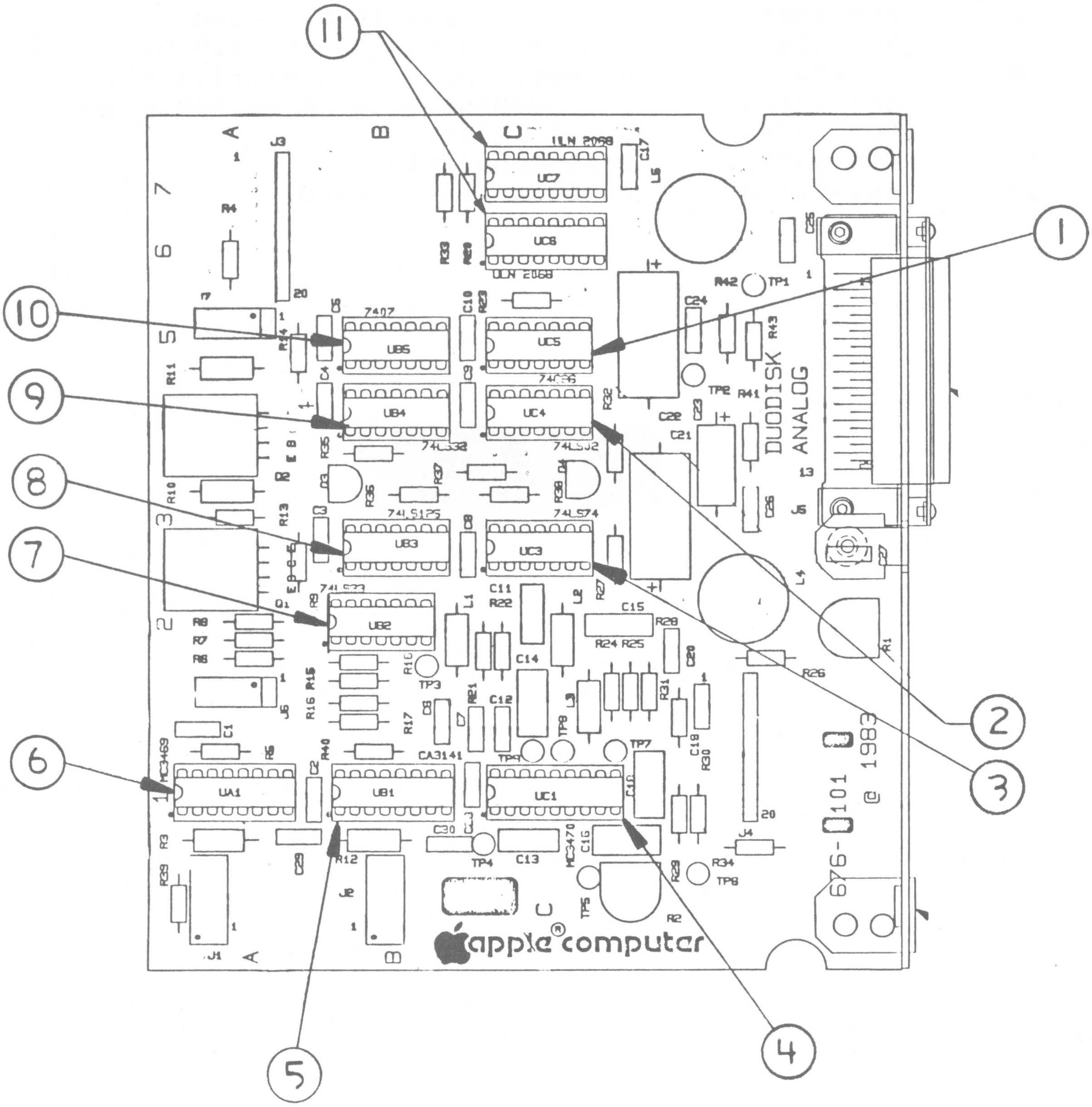


FIGURE 3

DUODISK ANALOG CARD (Figure 3)

1	322-0086	IC, 74C86
2	306-0002	IC, 74LS02
3	306-0074	IC, 74LS74
4	355-3470	IC, MC3470 Floppy Disk Read Ampl.
5	352-3141	IC, Hi Voltage Diode Diode 30V, 100 mA
6	332-3469	IC, 3469 Floppy Disk Write Cont.
7	306-0033	IC, 74LS33
8	306-0125	IC, 74LS125
9	306-0032	IC, 74LS32
10	302-0007	IC, 7407
11	352-2068	IC, 1.5A Darlington

Here's What To Do

Identify the symptom and replace the related chips, one at a time, in the order in which they are listed. Each time you replace a chip, turn the computer back on to see if the problem is gone. If the problem still exists after you have replaced all the chips related to the problem, go to the next step listed in the answer box (where you left off) on the troubleshooting flowchart.

	Symptom	Location	Defective Chip Type
1.	Motor runs, but LED is off	A1	3469
		B4	74LS32
		B5	74LS07
	Won't boot		
2.	Motor and LED are on	B1	CA3141
		B3	74LS125
		A1	MC3469
		C1	MC3470
	Won't boot	B2	74LS33
		B5	7407
		C3	74LS74
		C4	74LS02
		C6	ULN2068
		C7	ULN2068
3.	Drive reads but does not write	A1	MC3469
		B1	CA3141
		B2	74LS33
		B3	74LS125
		C5	74C86
		B5	7407
4.	Drive writes when diskettes are write protected	A1	MC3469

Duodisk Technical Procedures

Appendix A

SPECIAL REPAIR PROCEDURE FOR LOOSE ANALOG BOARDS

(DUODISKS WITH SERIAL NUMBER BELOW 325000)

BACKGROUND

On some Duodisks with serial numbers before 325000, the analog board is too loose and may slip out of its guide track (the forward supports on the sides of the shield - see Figure 1, #1, next page). This brings the analog board into contact with the disk mechanical assembly and may short circuit the board when power is applied. Where this condition exists, the sides of the shield must be bent inward slightly to prevent the board from falling. This document contains the procedure.

(This is a low-level problem, mostly limited to Duodisks found "dead on arrival". Apple has already upgraded the inventory of Duodisks with serial numbers of 325000 and above.)

PROCEDURE

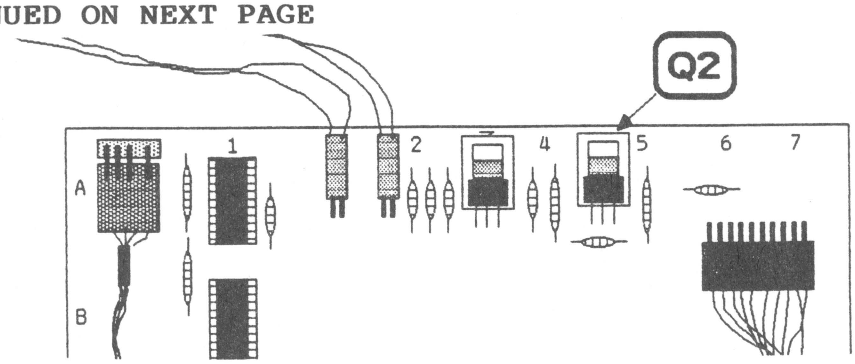
1. Check the serial number of the Duodisk: If it is below 325000, continue with this procedure.

2. Check to see if the board has slipped out of the guide track and if transistor Q2 on the front of the old board has blown (the damage will be visible.) If so, continue with this procedure.

3. If Q2 has blown, or if the board is otherwise bad, replace the bad analog board with a good board.

   If the board has not blown but has a visible tendency to fall off its supports, you should also perform this procedure.

CONTINUED ON NEXT PAGE



4. Using needlenose pliers, bend the top of the shield inward about 1 mm., so that the guides hold the analog board firmly in place (see Figure 1, #1).

   IMPORTANT: Do not bend the shield too far, as any stress on the mechanical assembly may cause problems with the head radial adjustment.

5. Run the Drive Acceptance Program (DAP) tests, to check for possible head radial adjustment problems due to stress on the mechanical assembly. If you find such problems, bend the shield back until they no longer occur. If the drive continues to fail the DAP, send it back to Apple for repair.

6. Look through the disk drive door to make sure that the analog board is seated correctly. If the analog board still shows a tendency to fall off its supports, repeat steps 4-6.

Top View of Shield, Drive 1

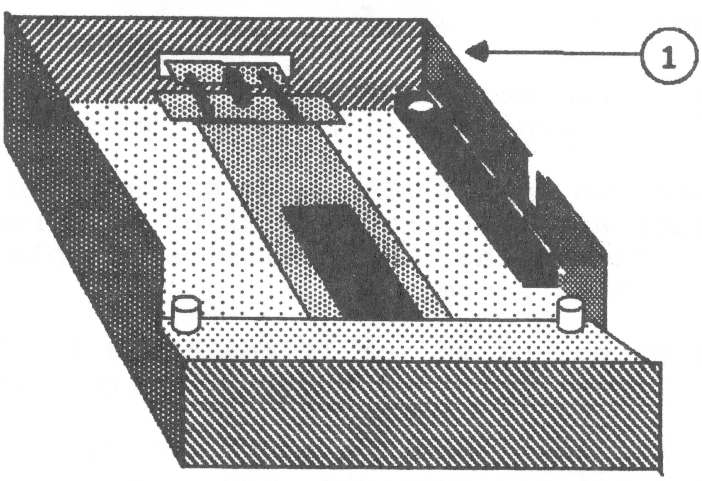


Figure 1

apple computer

Duodisk Technical Procedures

Appendix B

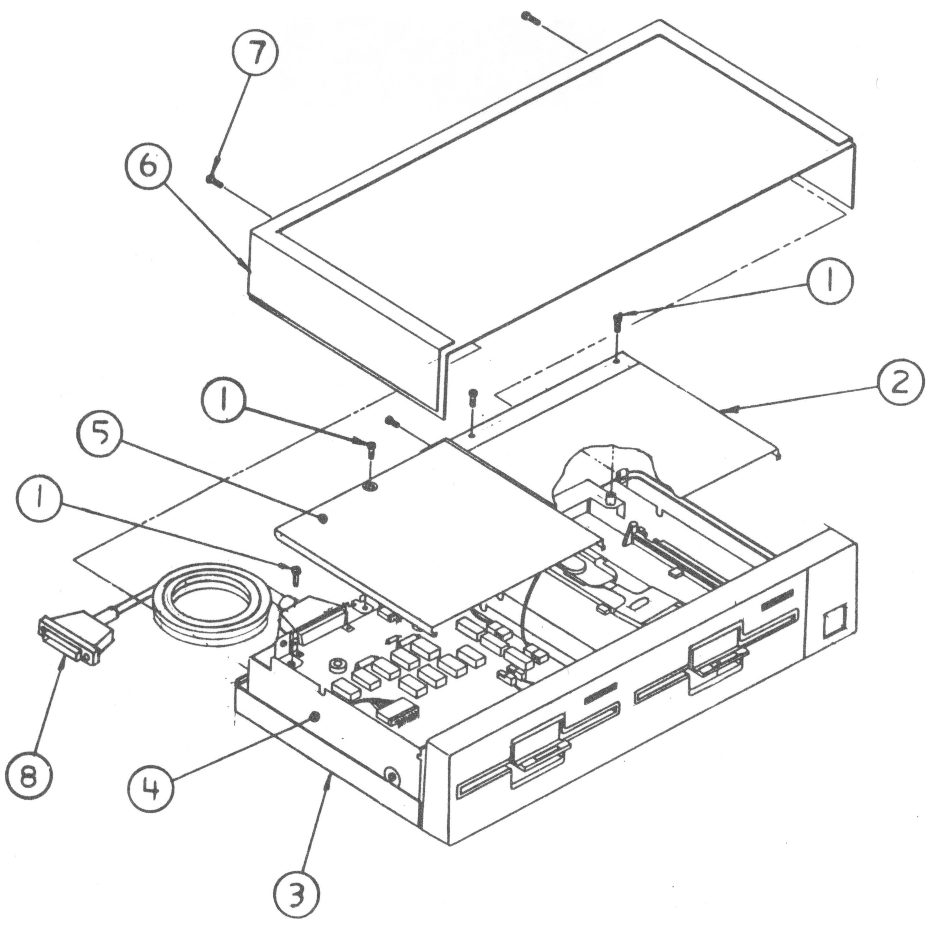
Illustrated Parts List

Contents

The figures and lists below include all piece parts that can be purchased separately from Apple for the DuodiskTM disk drive along with their part numbers. Refer to your Apple Service Programs binder for prices.

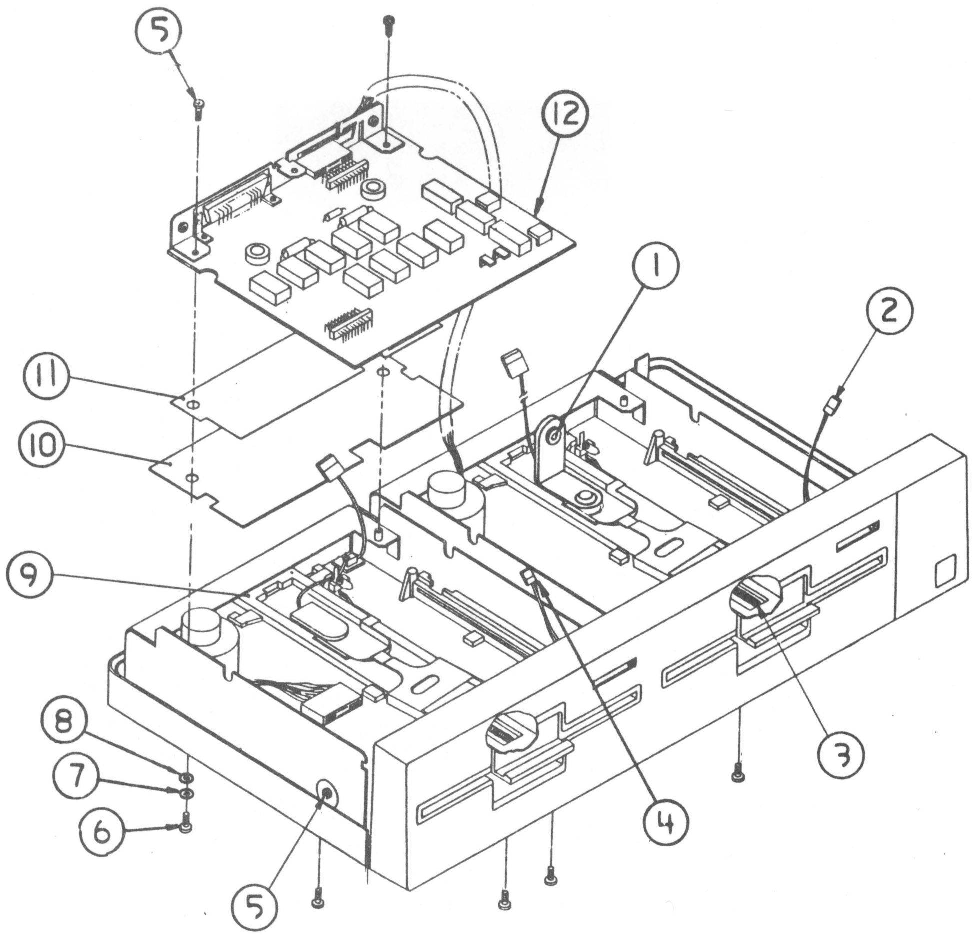
Duodisk (Figure 1)

Item	P/N	Description
1	400-1604	Screw 6-32xl/4
2	805-5002	Shield, Top, Drive 2
3	676-5101	Subassembly, Bottom Cover
4	805-5000	Shield, Bottom, Duodisk
5	805-5003	Shield, Mounting, Drive 1
6	676-5103	Top Cover Assembly
7	415-1410	Screw
8	590-0114	Assemlby Cable, DB-19 to Disk



Duodisk (Figure 2)

Item	P/N	Description
1	U815-0064	Load Button
2	590-0140	Assembly, Cable, LED, D1
3	870-0023	Spring
4	590-0223	Cable Assembly LED
5	400-1604	Screw 6-32x1/4
6	415-1410	Screw
7	860-0242	Washer, M3.5x4.0 I.D. x7.0 O.D
8	860-0053	Washer, Split Lock Metric, M3.5
9	661-72128	Disk Mechanical Assembly
10	805-5029	Seat Insulating
11	805-5028	Shield Plate
12	661-92130	Analog Card, Duodisk



UniDisk Technical Procedures

Section 2

Adjustments

Contents:

D-SPEED TEST AND ADJUSTMENT

Required Materials and Set Up

1. Set up a known good Apple II or IIe.

2. Connect a known good disk drive and interface card to slot 6 of the computer. You do not have to use another UniDisk.

   NOTE: If you do not know how to do this, refer to the Apple II owner's manual.

3. Install a known good UniDisk interface card into slot 5 of the computer.

4. Connect the UniDisk to be tested to the interface card in slot 5.

5. Obtain the following materials:

   a) Disk Alignment Aid (P/N 077-0031).

   b) A unprotected blank (scratch) diskette.

   c) A small (jeweler's) flatblade screwdriver.

The Test:

1. When the system is set up, insert the unprotected blank diskette into the UniDisk.

2. Place the Disk Alignment Aid in the known good drive (connected to slot 6) and turn on the computer. If you're using the Apple IIe, make sure that the CAPS LOCK key is down.

3. When the menu comes up, **SET TARGET DISK** will be highlighted. Type **A** to accept it.

   NOTE: If a menu selection is highlighted, typing A (accept) accepts the entry. Typing **S** (skip) causes the cursor to go to the next menu selection.

UniDisk Technical Procedures

Section 3

Take-Apart

Contents:

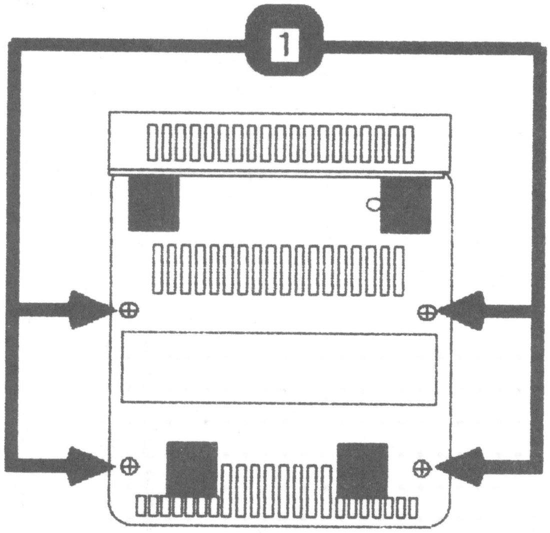


FIGURE 1

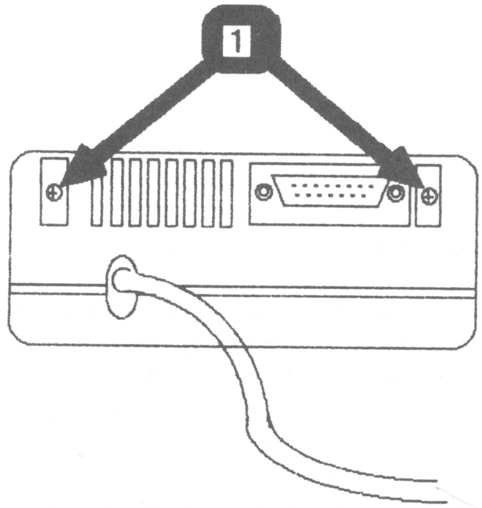


FIGURE 2

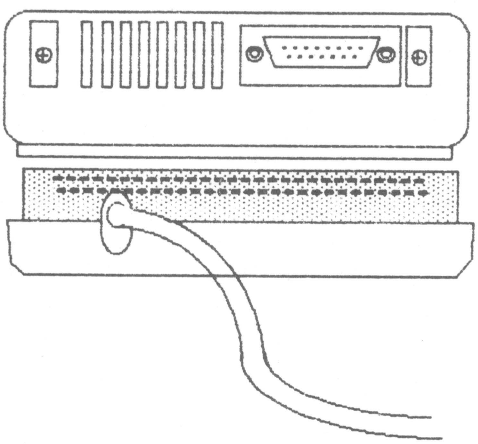


FIGURE 3

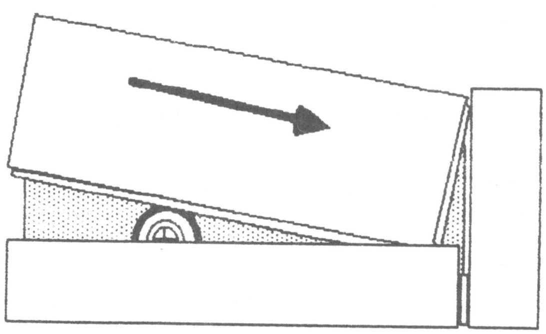


FIGURE 4

UniDisk Technical Procedures

Section 4

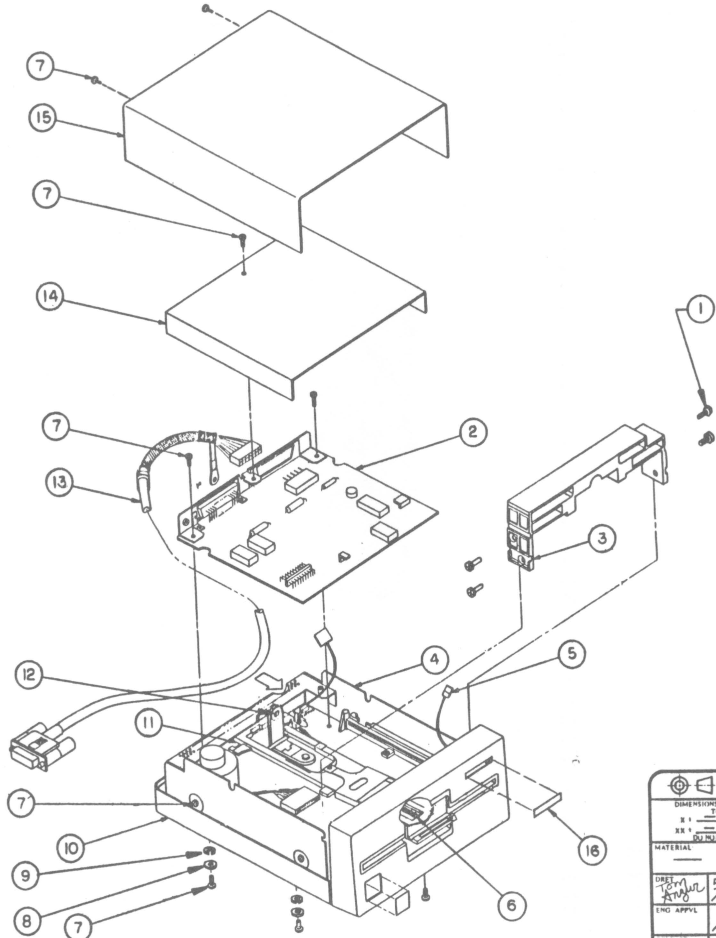
Illustrated Parts List

The figures and lists below include all piece parts that can be purchased separately from Apple for the Unidisk, along with their part numbers. These are the only parts available from Apple. Refer to your Apple Service Programs manual for prices.

Contents:

NOTE: UNLESS OTHERWISE SPECIFIED

REV.	ZONE	ECO #	REVISION	APPD	DATE
A		5493	INITIAL RELEASE		



PARTS LIST HELD BY APPLE SERVICE TRAINING.

METRIC
DIMENSIONS ARE IN MILLIMETERS
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DRFT CK
ENG APPVL
MFG APPVL
RELEASE
DIV: SERVICE
SCALE: NONE

TITLE: ILLUSTRATED PARTS LIST UNIDISK

SIZE: C | DRAWING NUMBER: 070-0237-A | SHT 1/1

070-0237-A 1/1

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A10000

UNIDISK

Item	Part No.	Description
1	400-3604	Screw, 6-32x 1/4, Pozi-Dr. Flt.
2	661-0287	Analog Card, UniDisk
3	970-1258	Sub-bezel Uni/DuoDisk
4	805-0890	Shield, Bottom
5	590-0140	Assembly, Cable, LED, Dl
6	870-0023	Spring
7	400-1604	Screw, 6-32x 1/4
8	860-0242	Washer, M3.5x 4.0 I.D. x 7.0 O.D.
9	860-0053	Washer, Split Lock Metric, 3.5m
10	675-5101	Subassembly Bottom Cover
11	661-72128	Uni/DuoDisk Disk Mech Assembly
12	U815-0064	Load Button
13	590-0327	Assembly, Cable Drive to CPU
14	675-5103	Top Case Assembly
15	805-0891	Shield, Top
16	825-0548	Label, Drive #, Uni/DuoDisk

Macintosh
External Drive

MACINTOSH EXTERNAL DISK DRIVES
TECHNICAL PROCEDURES

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Macintosh External Disk Drives
Technical Procedures

Section 1

Macintosh External Disk Drive (400K) Take-Apart

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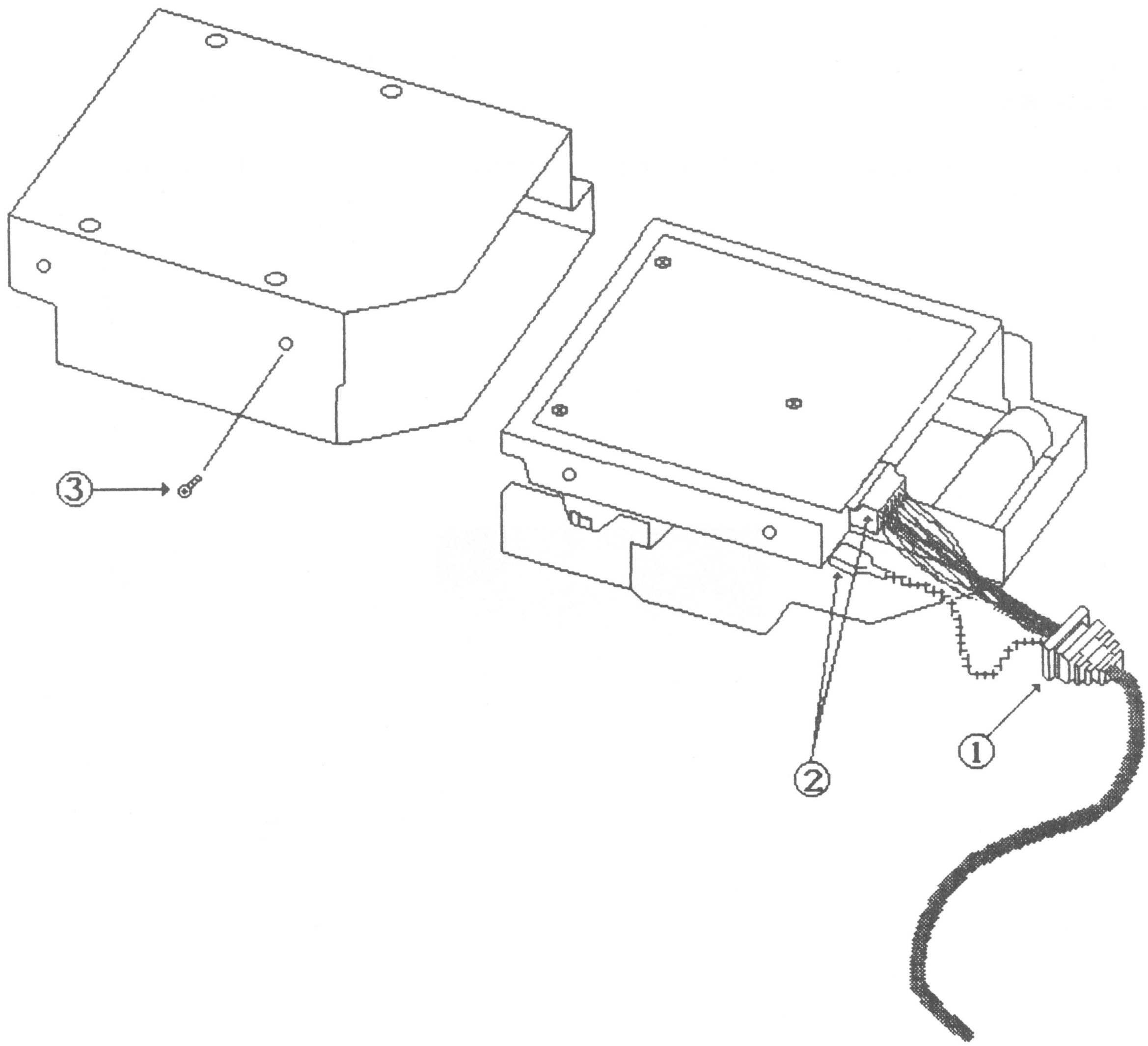


FIGURE 1

Remove and Replace the External Disk Drive:

Equipment Required:

#1 Phillips screwdriver

1. Turn the disk drive over with the bottom facing up.

2. Remove the six screws and washers from the bottom cover. **NOTE:** The two black screws do not have washers.

3. Lift up the back of the bottom cover about an inch and pull it out from the front bezel.

4. Lift up the cable grommet (see Figure 1, #1) from the case and support it with one hand; with the other hand lift up the back of the metal drive housing and remove the drive from the bottom cover.

5. Carefully remove the cable connector. Remove the screw that holds the grounding tab to the disk drive (see Figure 1, #2). **Do not remove the grounding strap from the grounding tab.**

   NOTE: The grounding tab is not included on exchange drive mechanisms.

6. Remove the screw on the outside of the metal drive housing (see Figure 1, #3).

7. Slide the drive out of the metal housing.

Replace:

1. Connect the drive cable. Position the grounding tab and replace the screw on the new drive (see Figure 1, #2).

2. Place the new drive into the metal housing and replace the screw (see Figure 1, #3).

3. Place the drive into the bottom cover at an angle and support the cable assembly while you push the drive forward.

4. Replace the cable grommet in its slot.

5. Replace the top cover and screws.

Macintosh External Disk Drives
Technical Procedures

Section 2

Macintosh 800K External Disk Drive Take-Apart

Contents:

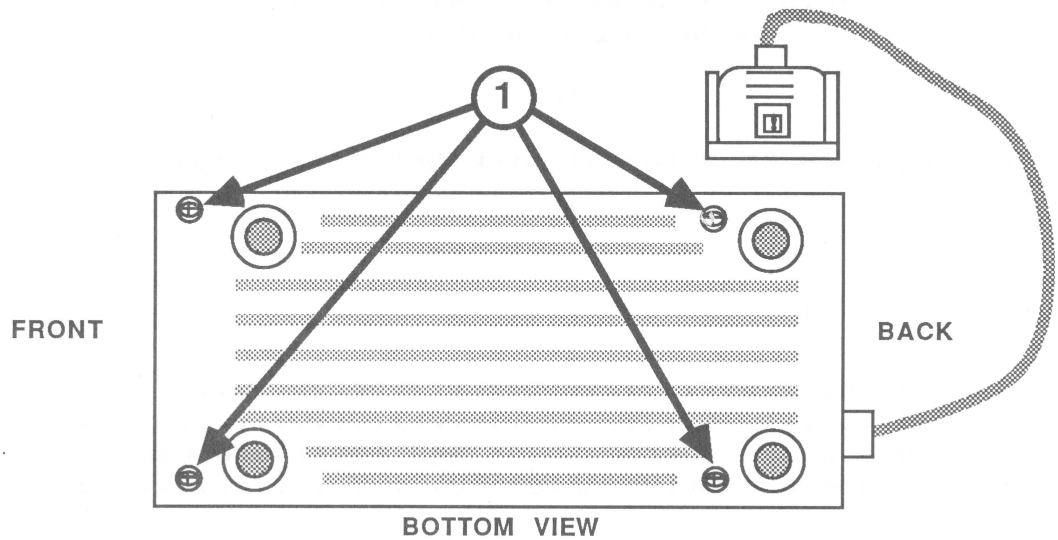


FIGURE 1

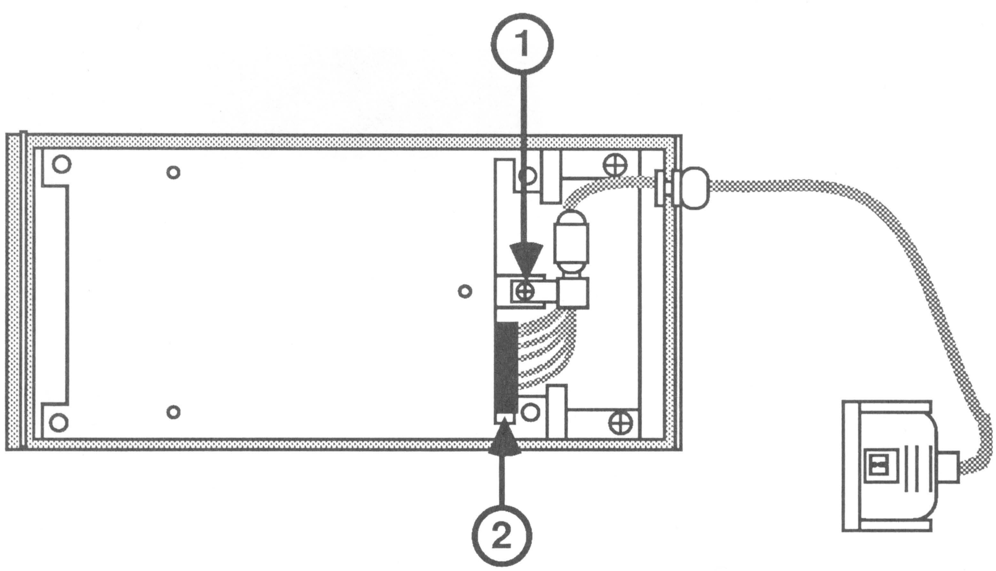


FIGURE 2

THINGS TO REMEMBER

1. The Macintosh Logic board should have new ROMs installed to support the 800K external drive. If the ROMs are not installed, the Macintosh will not recognize the external drive. (Refer to **Macintosh Technical Procedures, Section 4, Additional Procedures** for more information.)

2. You may use 400K media in the 800K drive, but if you do the 800K drive may emit a high squealing sound. This does not indicate a problem. The 400K media is coarse and the 800K drive has very tight specifications. This will not cause damage to either the drive or the media.

3. When transporting or shipping the 800K drive, be sure to have the packing diskette installed in the disk drive.

TOOLS REQUIRED

The following tools will be needed for the take-apart procedures:

Phillips screwdriver - medium

REMOVE AND REPLACE THE BOTTOM COVER AND INTERFACE CABLE

Remove

1. Remove the four screws (see Figure 1, #1).

2. Lift the bottom cover off.

3. Remove the screw from the clamp holding the interface cable in place (see Figure 2, #1).

4. Disconnect the interface cable from the drive (see Figure 2, #2).

Replace

1. Connect the interface cable to the drive (see Figure 2, #2).

2. Position the clamp holding the interface cable and replace the screw (see Figure 2, #1).

3. Position the bottom cover and replace the four screws (see Figure 1, #1).

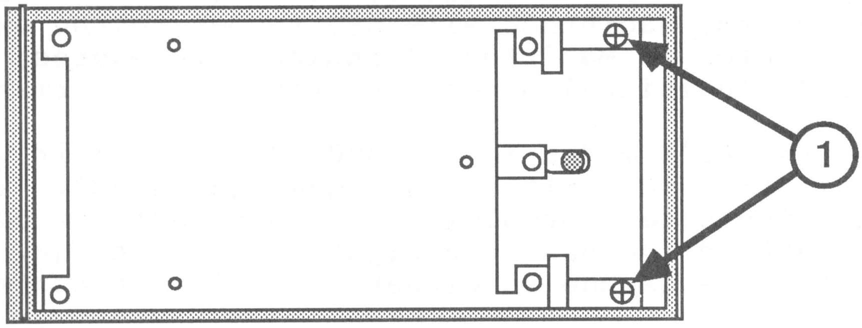


FIGURE 3

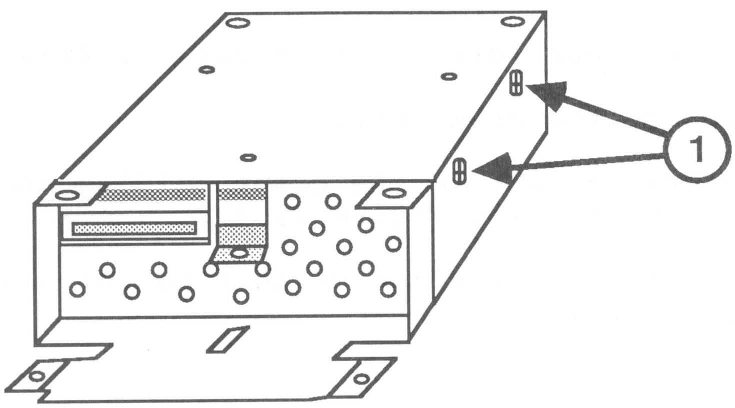


FIGURE 4

REMOVE AND REPLACE THE DRIVE ASSEMBLY

Remove

1. Remove the bottom cover and the interface cable.

2. Remove the two screws (see Figure 3, #1).

3. Lift the drive assembly from the top cover.

4. Remove the four screws that hold the drive assembly in the housing. There are two screws on each side. Figure 4, #1, shows one side.

5. Slide the drive assembly out of the housing.

Replace

1. Position the housing top up and slide the drive assembly, connectors first, into the housing. The drive assembly fits snugly between the screw mounts on the housing.

2. Start the four screws that hold the drive assembly in place. After all four screws are started, tighten each one. There are two screws on each side of the housing. Figure 4, #1, shows one side.

3. Position the drive assembly on the top cover so the screw holes line up. Replace the two screws (see Figure 3, #1).

4. Replace the interface cable and the bottom cover.

Macintosh External Disk Drives
Technical Procedures

Section 3

Illustrated Parts List

The figures and lists below include all piece parts that can be purchased separately from Apple for the Macintosh External Disk Drives, along with their part numbers. These are the only parts available from Apple. Refer to your Apple Service Programs manual for prices.

Contents:

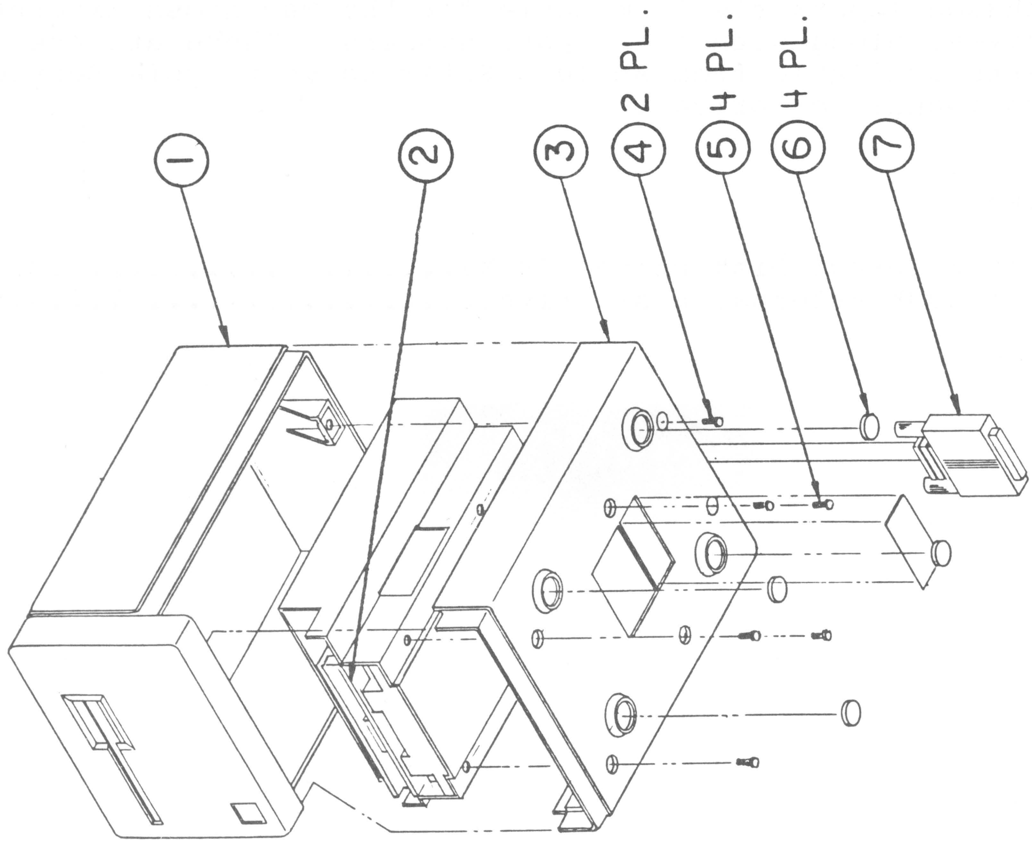


FIGURE 1

MACINTOSH EXTERNAL DISK DRIVE (400K) - Figure 1

Item	Part No.	Description
1	815-0796	Cover, Upper, Macintosh External Drive
2	661-76156	Micro Disk Assembly
3	815-0795	Cover, Lower, Macintosh External Drive
4	424-1001	Screw, Tap M2.9x1.06x13
5	467-3000	Screw, M3.5x10
6	865-0011	Foot, Macintosh
7	590-0183	Macintosh External Drive Cable

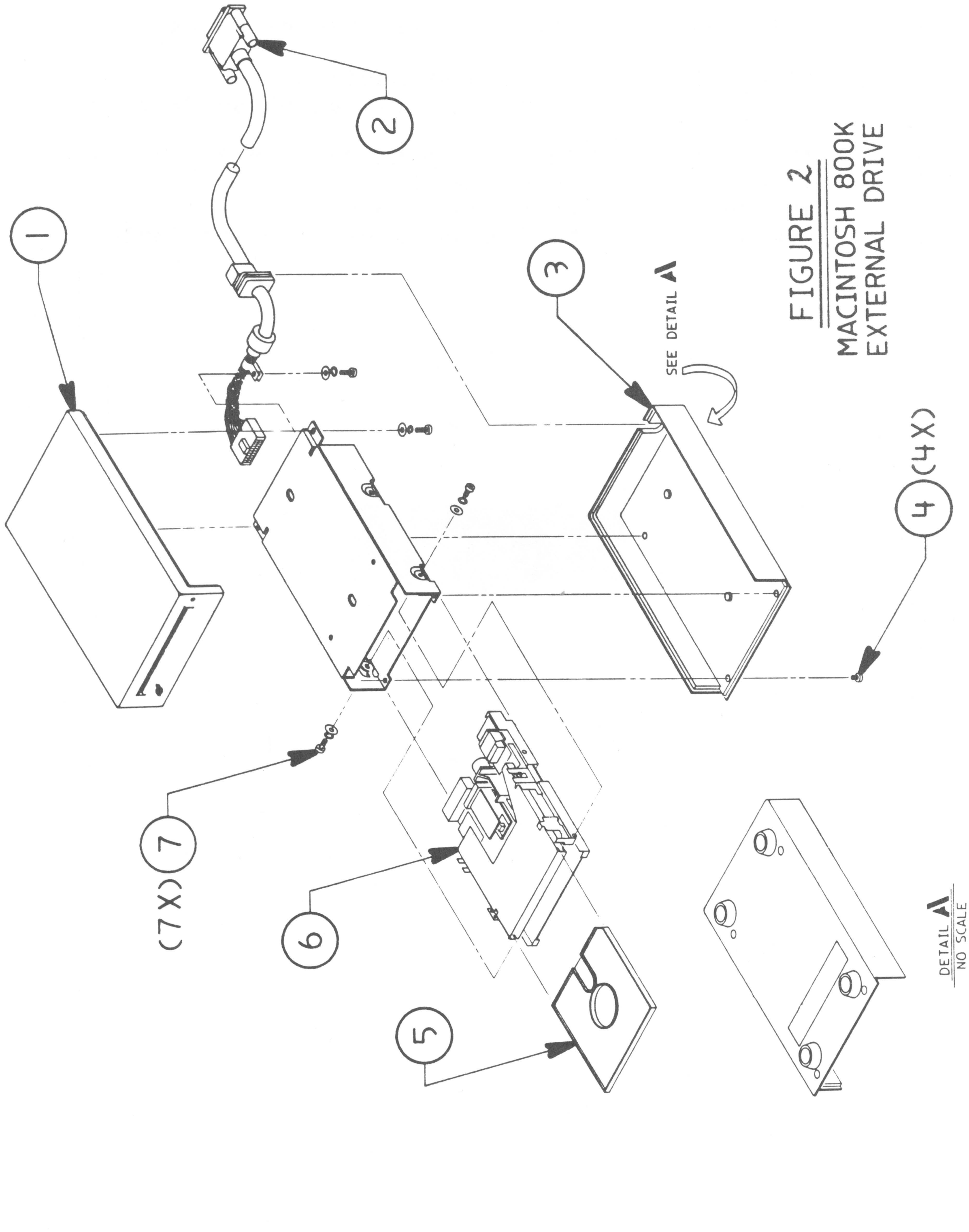


FIGURE 2
MACINTOSH 800K
EXTERNAL DRIVE

MACINTOSH 800K EXTERNAL DISK DRIVE - Figure 2

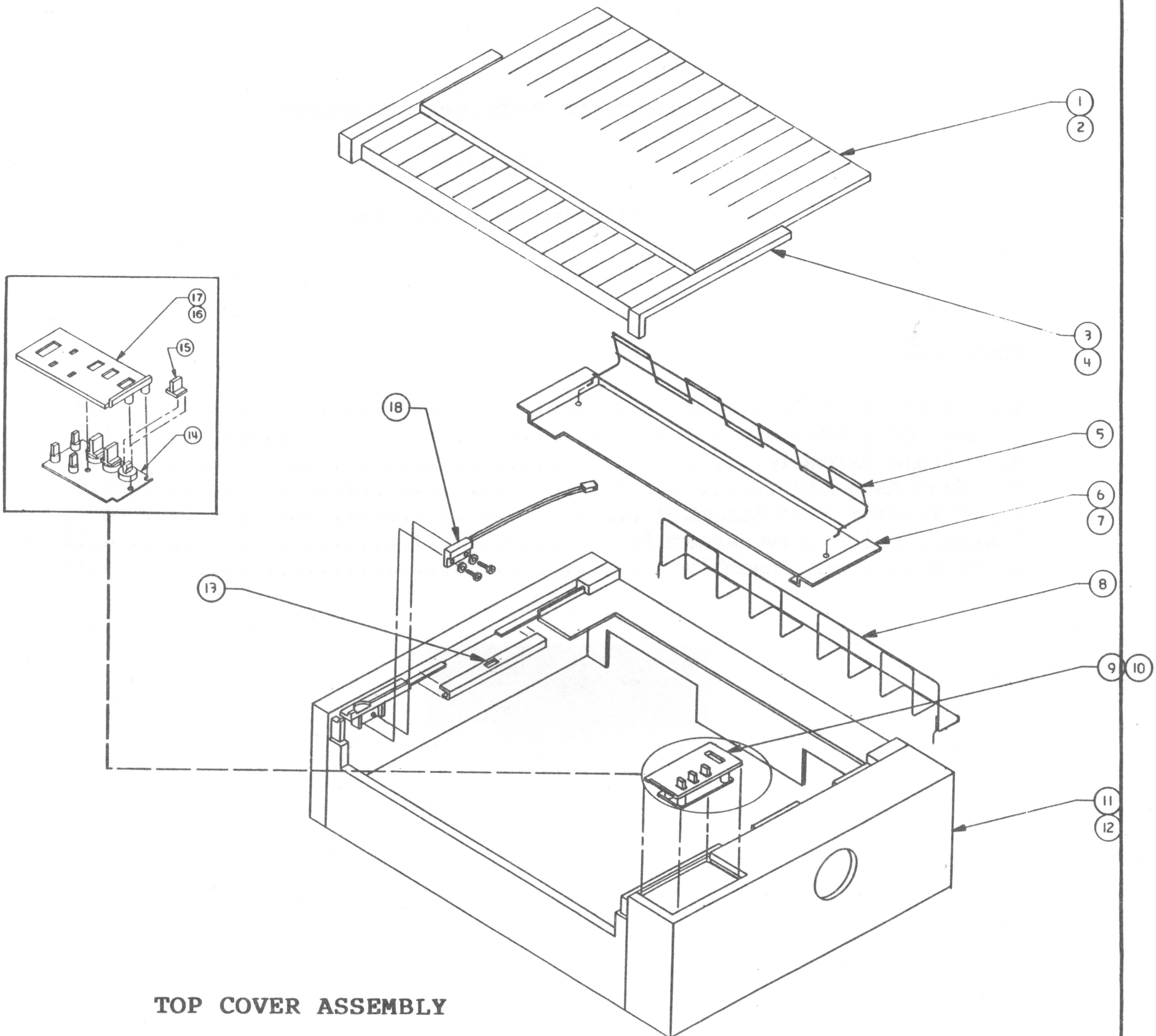
Item	Part No.	Description
1	630-5180	Assy, Top Case, 800K Drive
2	590-0255	External Drive Cable, 800K
3	630-5181	Assy, Bottom Case, 800K Drive
4	416-1305	Screw, Torx, 800K External Drive
5	003-0003	Packing Disk (for transporting)
6	661-0305	Drive Mechanism 800K
7	462-3401	Screw, M3x6, w/two washers, 800K

Imagewriter Technical Procedures

Section 4

Illustrated Parts List

Contents:

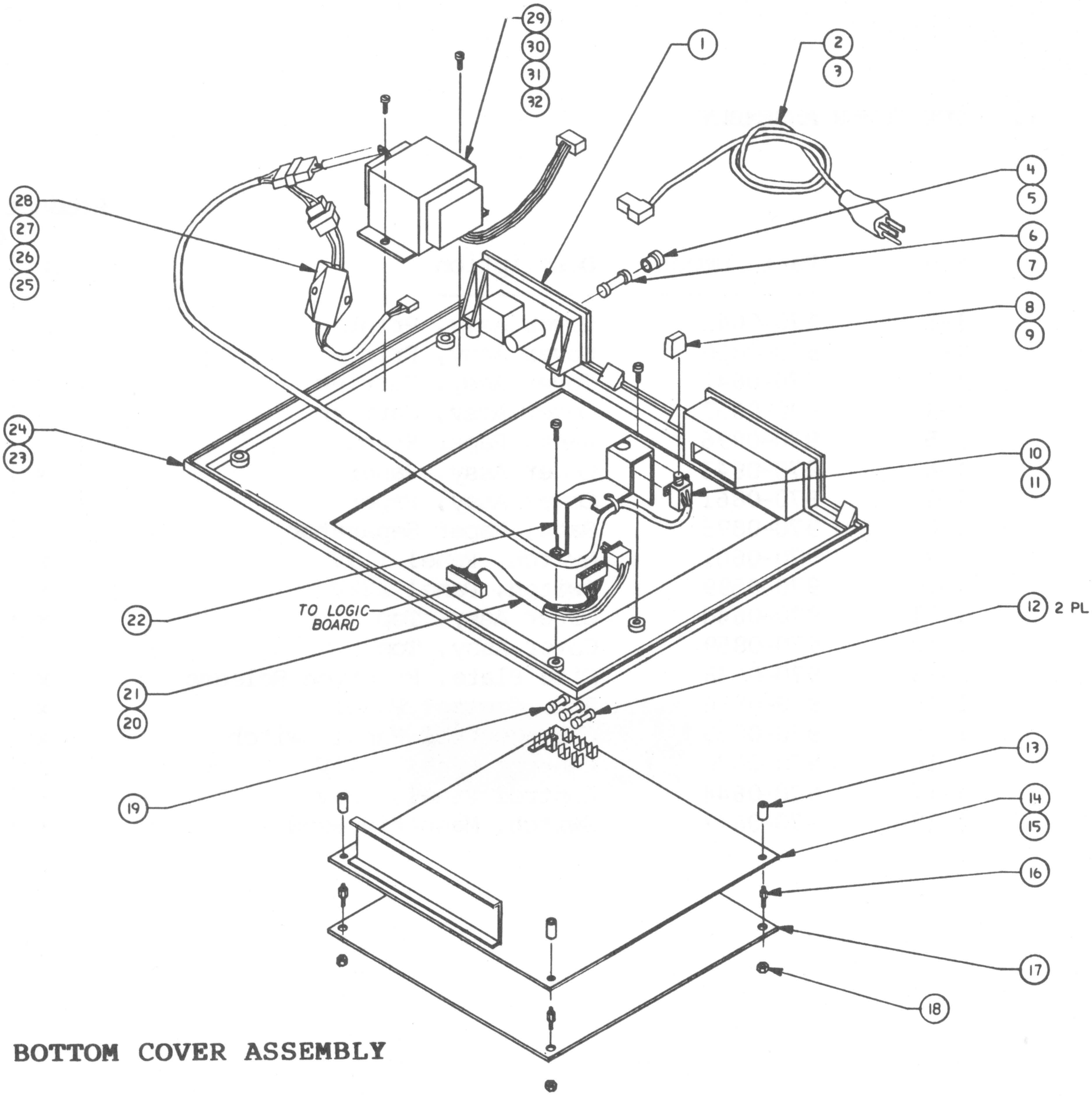


TOP COVER ASSEMBLY

FIGURE 1

1. TOP COVER ASSEMBLY

Fig	Part Number	Description	Product Used ON IW	15 IW
1-1	970-0642	Cover Assy, Print	x	
1-2	970-0856	Cover Assy, Print		x
1-3	970-0641	Cover Assy, Carrier	x	
1-4	970-0857	Cover Assy, Carrier		x
1-5	970-0896	Rack, Paper Stand		x
1-6	970-0643	Cover Assy, Paper	x	
1-7	970-0861	Cover Assy, Paper		x
1-8	970-0895	Rack, Paper Separator		x
1-9	970-0601	Switch, Panel 110V	x	x
1-10	970-0599	Switch, Panel 220V	x	x
1-11	970-0640	Cover Assy, Top	x	
1-12	970-0859	Cover Assy, Top		x
1-13	970-0648	Side Plate, Friction Release	x	x
1-14	970-0866	PCB, Control Panel	x	x
1-15	970-0835	Cap, Control Panel Switch	x	x
1-16	970-0636	Control Panel, 110V	x	x
1-17	970-0644	Control Panel, 220V	x	x
1-18	970-0647	Switch, Magnetic Reed	x	x

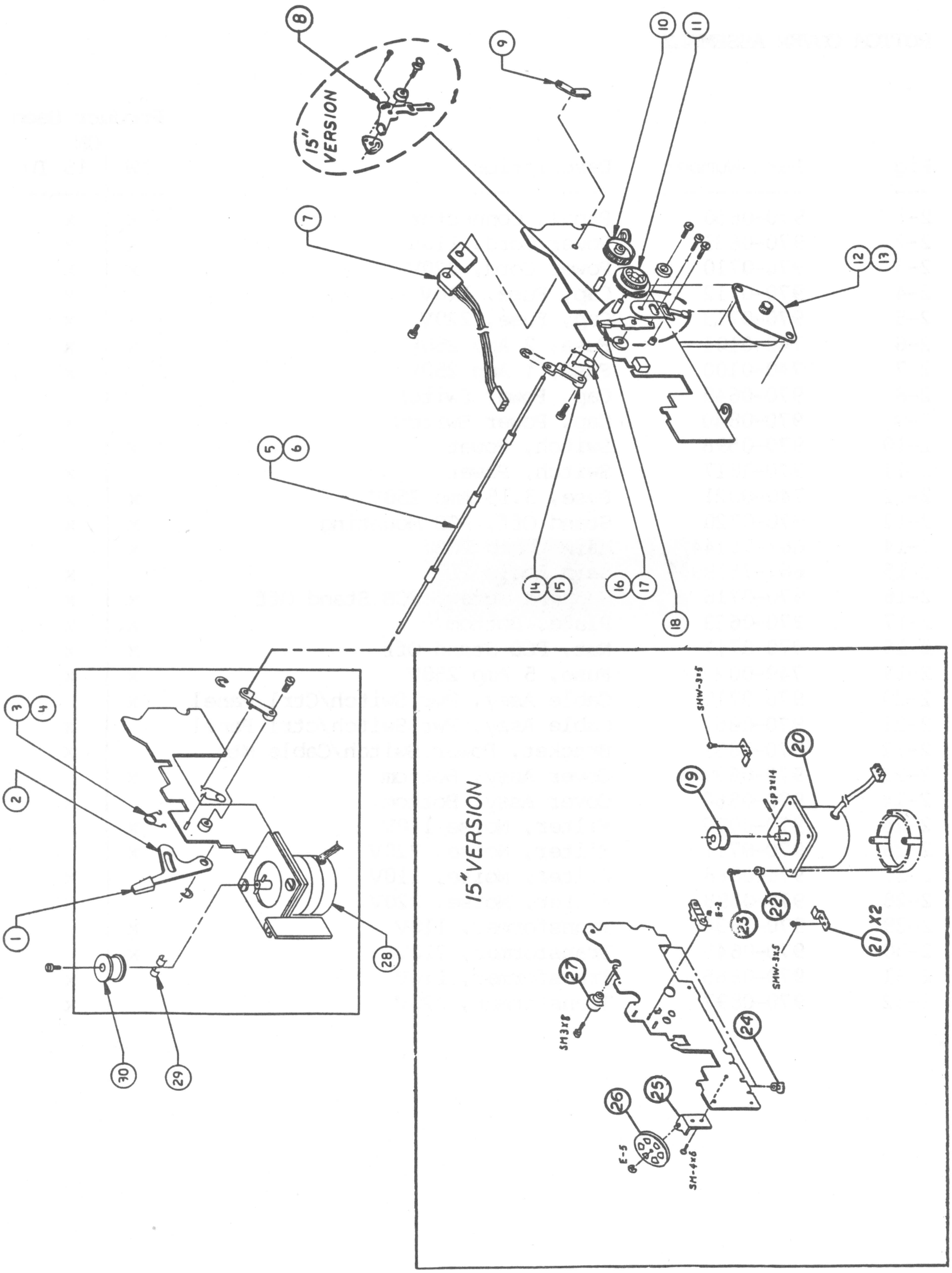


BOTTOM COVER ASSEMBLY

FIGURE 2

2. BOTTOM COVER ASSEMBLY

Fig	Part Number	Description	Product Used ON IW	15 IW
2-1	970-0650	Panel, Connector	x	x
2-2	970-0635	Power Cord, 110V	x	x
2-3	970-0710	Power Cord, 220V	x	x
2-4	970-0712	Cap, Fuse, 110V	x	x
2-5	970-0713	Cap, Fuse, 220V	x	x
2-6	740-0101	Fuse, 2 Amp 250V	x	x
2-7	740-0100	Fuse, 1 Amp 250V	x	x
2-8	970-0649	Cap, Power Switch	x	
2-9	970-0840	Cap, Power Switch		x
2-10	970-0598	Switch, Power	x	
2-11	970-0817	Switch, Power		x
2-12	740-0021	Fuse, 3.15 Amp 250V	x	x
2-13	970-0720	Stand Off, PCB Mounting	x	x
2-14	661-75144	Main Logic PCB	x	
2-15	661-75199	Main Logic PCB		x
2-16	970-0716	Support Screw, PCB Stand Off	x	x
2-17	970-0633	Plate, Bottom	x	x
2-18	970-0717	Nut, PCB Stand Off	x	x
2-19	740-0022	Fuse, 5 Amp 250V	x	x
2-20	970-0715	Cable Assy, Pwr Switch/Ctrl Panel	x	
2-21	970-0867	Cable Assy, Pwr Switch/ctrl Panel		x
2-22	970-0831	Bracket, Power Switch/Cable Mtg		x
2-23	970-0639	Cover Assy, Bottom	x	
2-24	970-0860	Cover Assy, Bottom		x
2-25	970-0072	Filter, Noise 110V	x	
2-26	970-0711	Filter, Noise, 220V	x	
2-27	970-0868	Filter, Noise, 110V		x
2-28	970-0898	Filter, Noise, 220V		x
2-29	970-0634	Transformer, 110V	x	
2-30	970-0645	Transformer, 220V	x	
2-31	970-0865	Transformer, 110V		x
2-32	970-0897	Transformer, 220V		x

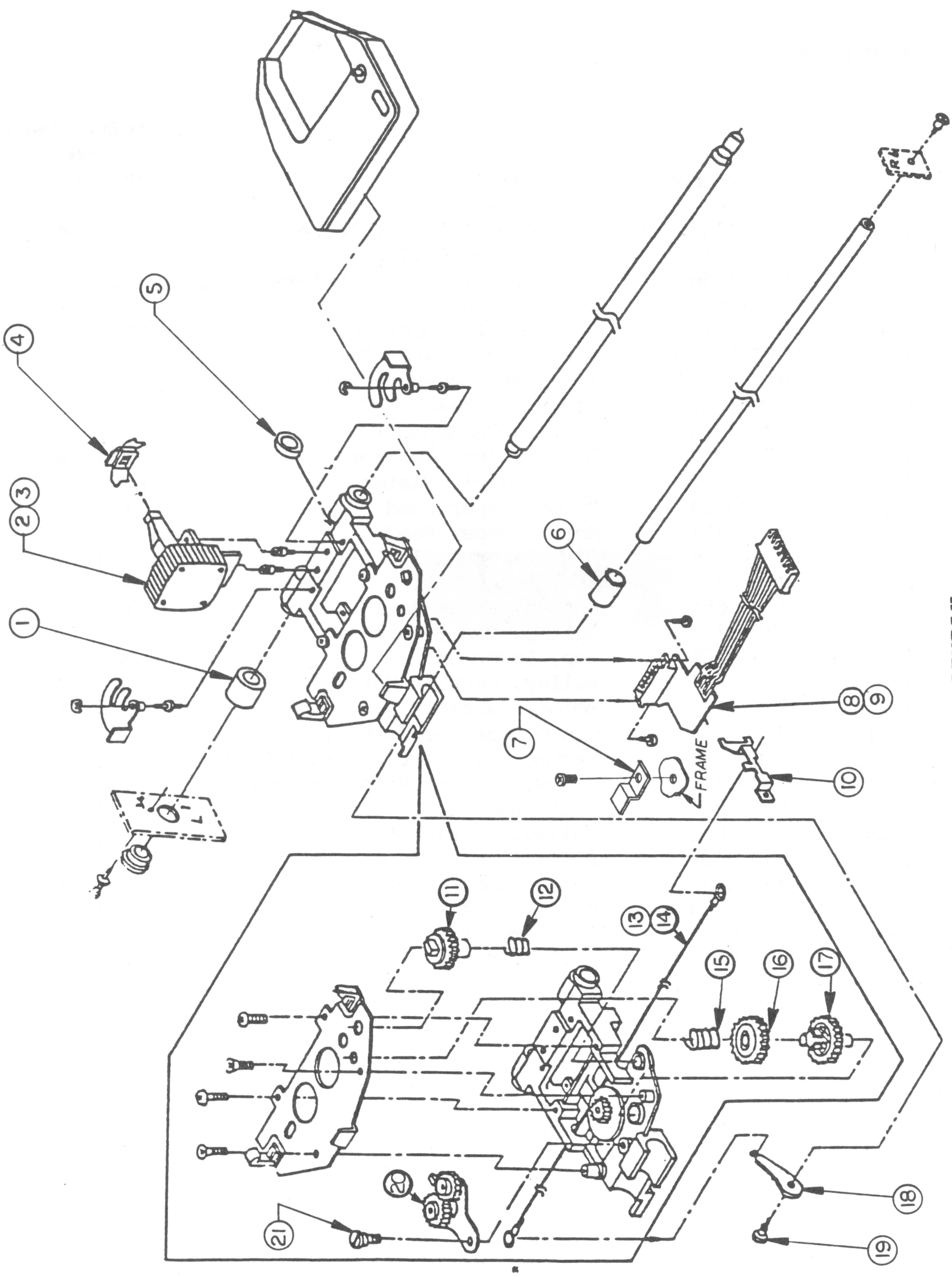


MAIN FRAME ASSEMBLY

FIGURE 3

3. MAIN FRAME

Fig	Part Number	Description	Product Used ON IW	15 IW
3-1	970-0839	Cap, Feed Roller Release		x
3-2	970-0850	Lever, Feed Roller		x
3-3	970-0056	Spring, Feed Roller Release	x	
3-4	970-0832	Spring, Feed Roller Release		x
3-5	699-0110	Shaft Assy, Paper Bail	x	
3-6	970-0858	Shaft Assy, Paper Bail		x
3-7	970-0082	Transistor Assy, 5 Volt	x	x
3-8	970-0829	Lever, Impression Control		x
3-9	970-0830	Plate, PCB Support		x
3-10	970-0051	Gear, Idler, Tractor	x	x
3-11	970-0052	Gear, Idler, Platen	x	x
3-12	699-0109	Motor, Paper Feed	x	
3-13	970-0851	Motor, Paper Feed		x
3-14	970-0838	Arm, Paper Bail		x
3-15	970-0977	Arm, Paper Bail	x	
3-16	970-0054	Spring, Paper Bail	x	
3-17	970-0833	Spring, Paper Bail		x
3-18	970-0638	Cap, Lever Set	x	
3-19	970-0841	Pulley, Carrier Motor		x
3-20	970-0845	Motor, Carrier		x
3-21	970-0828	Clamp, Carrier Motor		x
3-22	970-0849	Grommet, Carrier Motor, Rubber		x
3-23	970-0822	Screw, Carrier Motor Release		x
3-24	970-0847	Foot, Rubber		x
3-25	970-0853	Pulley, Carrier Holder		x
3-26	970-0837	Pulley, Idler		x
3-27	970-0874	Foot, Rubber Stop		x
3-28	970-0630	Motor, Carrier	x	
3-29	970-0081	Shim, Motor Shaft	x	
3-30	970-0053	Pulley, Motor	x	

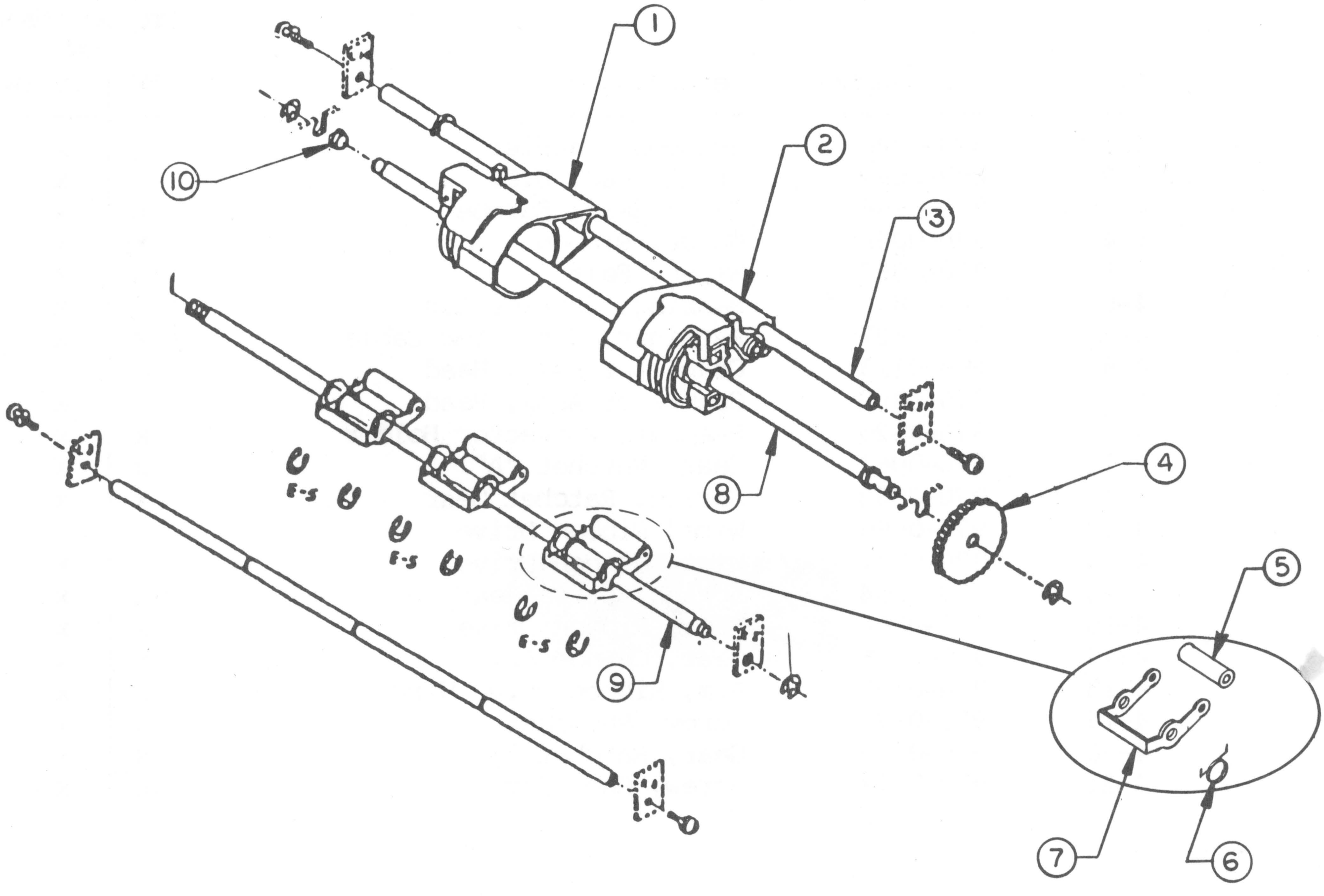


DOT HEAD ASSEMBLY

FIGURE 4

4. DOT HEAD ASSEMBLY

Fig	Part Number	Description	Product Used ON IW	15 IW
4-1	970-0848	Stopper, Carrier		x
4-2	699-0092	Print Head, U.S.	x	x
4-3	970-0646	Print Head, Europe	x	x
4-4	970-0059	Guide, Ribbon	x	x
4-5	970-0067	Wiper, Felt	x	x
4-6	970-0842	Bearing, Carrier Assy		x
4-7	970-0827	Retainer, Connector Cable	x	x
4-8	699-0113	Connector Assy, Head	x	
4-9	970-0862	Connector Assy, Head		x
4-10	970-0826	Bracket, Connector Holder	x	x
4-11	970-0061	Gear, Ratchet "A"	x	x
4-12	970-0063	Spring, Ratchet Gear	x	x
4-13	970-0066	Wire, Ribbon Drive	x	
4-14	970-0844	Wire, Ribbon Drive		x
4-15	970-0064	Spring, Drive Gear	x	x
4-16	970-0060	Gear, Ribbon Drive	x	x
4-17	970-0065	Gear, Change Arm	x	x
4-18	970-0825	Arm, Ribbon Drive Wire	x	x
4-19	970-0875	Screw, Shoulder	x	x
4-20	970-0062	Gear, Ratchet "B"	x	x
4-21	970-0719	Screw, Shoulder	x	x



PAPER/TRACTOR FEED ASSEMBLY

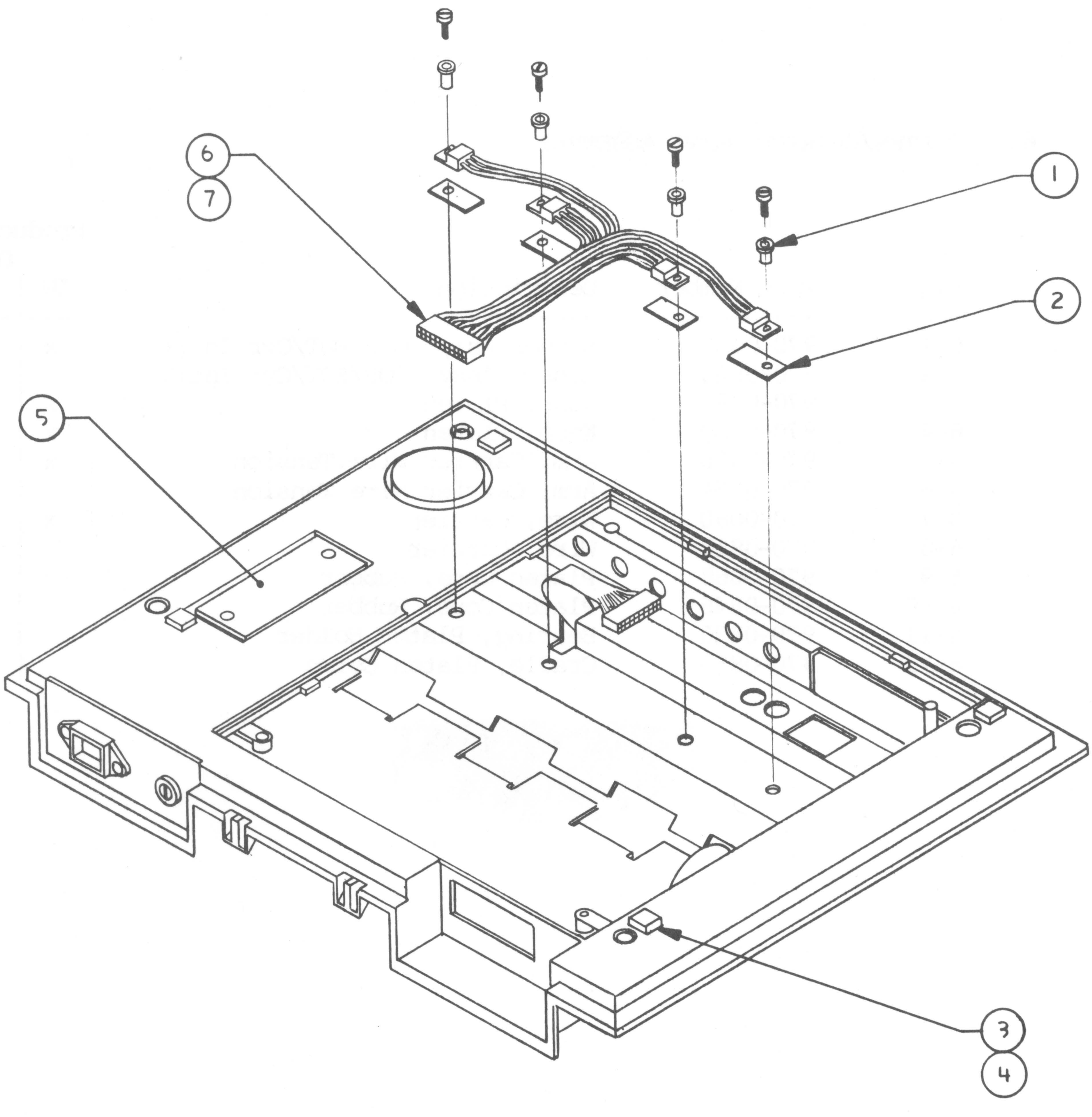
FIGURE 5

5. PAPER/TRACTOR FEED ASSEMBLY

Fig	Part Number	Description	Product Used ON IW	15 IW
5-1	970-0631	Sprocket, Left	x	x
5-2	970-0632	Sprocket, Right	x	x
5-3	970-0820	Shaft, Tractor Feed Drive		x
5-4	970-0057	Gear, Tractor Feed	x	x
5-5	970-0058	Feed Roller	x	x
5-6	970-0055	Spring, Feed Roller	x	x
5-7	970-0823	Arm, Feed Roller Support	x	x
5-8	970-0819	Shaft, Tractor Feed Support		x
5-9	970-0821	Shaft, Platen Feed Roller		x
5-10	970-0834	Cam, Feed Roller Shaft	x	x

6. PLATEN/CARRIER DRIVE ASSEMBLY

Fig	Part Number	Description	Product Used ON IW	Product Used ON 15 IW
6-1	970-0637	Sensor Assy, OOP/EOT/Cvr Intlk	x	
6-2	970-0864	Sensor Assy, OOP/EOT/Cvr Intlk		x
6-3	970-0069	Gear, Platen	x	x
6-4	970-0600	Knob, Platen	x	x
6-5	970-0070	Arm, Carrier Wire Tension	x	
6-6	970-0854	Arm, Carrier Wire Tension		x
6-7	970-0080	Wire, Carrier	x	
6-8	970-0818	Wire, Carrier		x
6-9	970-0068	Platen Core, Rubber	x	
6-10	970-0846	Platen Core, Rubber		x
6-11	970-0836	Bearing, Platen Holder		x
6-12	970-0855	Cradle, Platen Guide		x



LOWER MAIN FRAME ASSEMBLY

FIGURE 7

7. LOWER MAIN FRAME ASSEMBLY

Fig	Part Number	Description	Product Used ON IW	Product Used ON 15 IW
7-1	860-0034	Washer, Shoulder Nylon	x	x
7-2	725-0006	Insulator, Silicon Rubber	x	x
7-3	970-0714	Foot, Rubber	x	
7-4	970-0843	Foot, Rubber		x
7-5	970-0824	Plate, Transformer Cover	x	x
7-6	699-0120	Transistor Assy, Carrier Drive	x	
7-7	970-0863	Transistor Assy, Carrier Drive		x

Hard Disk 20

HARD DISK 20 TECHNICAL PROCDURES

TABLE OF CONTENTS

Section 1 - Basics

Section 2 - Diagnostics

Section 3 - Troubleshooting

Section 4 - Take-Apart

Section 5 - Illustrated Parts List

Hard Disk 20 Technical Procedures

Section 1

Basics

Contents:

INTRODUCTION

The Hard Disk 20 gives the Macintosh™ personal computer twenty megabytes of storage. Twenty megabytes is equivalent to about fifty single-sided 3 1/2 inch diskettes. The Hard Disk 20 is connected to the external drive port on the rear of the Macintosh. If additional storage is needed, you can link another Hard Disk 20 or an external disk drive to the first Hard Disk 20 connected.

For more detailed information refer to the <u>Hard Disk 20 User's Manual</u>.

SETTING UP

NOTE: The Hard Disk 20 is a mechanical device with moving parts. Rough handling such as jarring or bumping, especially while it is running, can result in a mechanical failure or can damage the information which is stored on the Hard Disk 20.

Connecting and Switching On the Hard Disk 20

1. Make sure power is off to both the Hard Disk 20 and the Macintosh.

2. Attach the interface cable from the Hard Disk 20 to the external drive port on the rear of the Macintosh.

3. Attach the Hard Disk 20 power cord to the hard disk, and plug the power cord into a three prong AC outlet.

4. Power on the Hard Disk 20. (The Macintosh should be off.)

   The hard disk whirrs and chirps. In 15 seconds the green light in front should be steady (unblinking).

5. Insert the Hard Disk 20 Startup diskette into the internal drive on the Macintosh and power on the system.

   If the Hard Disk 20 has been initialized, the Macintosh will eject the Hard Disk 20 Startup diskette and the desktop will appear with a hard disk icon in the upper right hand corner.

   If the Hard Disk 20 is damaged or uninitialized, the Macintosh will give you options to repair it or initialize it.

Switching Off The Hard Disk 20

IMPORTANT: Never switch off the power if the green light is blinking. You may lose information on the hard disk.

1. If you are working with an application program, quit and return to the desktop.

2. Wait till the green light is steady and unblinking. Power off the Hard Disk 20.

3. Power off the Macintosh.

INITIALIZING

To reinitialize a Hard Disk 20:

1. Pull down the **Special** menu and select **Erase Disk.**

2. Copy the **System Folder** icon from the **Hard Disk 20 Startup** diskette onto the hard disk icon in the upper right hand corner.

3. Copy any applications and backup files onto the hard disk.

NOTE: When you initialize or erase a customer's hard disk, <u>everything</u> wil be removed. If this is the only option you have, notify the customer to find out if his files are backed up.

Hard Disk 20 Technical Procedures

Section 2

Diagnostics

Contents:

INTRODUCTION

The HD20 Test is located on the Hard Disk 20 Startup diskette. The diagnostic is a pass/fail functionality test. It runs a self test, ID test, random single block test, random multi-block read test, and scandrive test. This test will run only if the hard disk will come ready. The test runs for approximately 15 minutes.

NOTE: Before running the diagnostic, make a backup copy of the Hard Disk 20 Startup diskette. For information on making disk copies refer to the <u>Macintosh Owner's Manual</u>.

EQUIPMENT NEEDED

Known good Macintosh
Known good Hard Disk 20 Startup diskette
Questionable Hard Disk 20
The following technical procedures

DIAGNOSTICS

Running the Test

1. Set up the hard disk and the Macintosh (refer to **Section 1, Basics**).

   The desktop will appear with the hard disk icon in the upper right hand corner.

   If the Hard Disk 20 Startup diskette is not ejected, go to step 3.

   If the Hard Disk 20 Startup diskette is ejected, continue to the next step.

2. Reinsert the Hard Disk 20 Startup diskette.

   The diskette icon should appear in the upper right hand corner.

3. Open the Hard Disk 20 Startup diskette.

4. Open the **HD20 Test** icon.

5. Click on the **Start** box.

   The hard disk will go through the various tests.

6. On completion of the test the **Pass** or **Fail** box will be highlighted.

   If the **Fail** box is highlighted go to **Section 3, Troubleshooting**.

Extended Test

An extended test will allow you to run the diagnostics on the Hard Disk 20 overnight. This will prove useful as a final test or if you have an intermittant problem.

To run a continuous test, follow steps one through four listed above. When the test screen appears on the Macintosh hold down the **Command** key and press the letter **E**. A dialog box will appear asking if you wish to run the extended test. Click in the appropriate box.

Hard Disk 20 Technical Procedures

Section 3

Troubleshooting

Contents:

THINGS TO REMEMBER

The Hard Disk 20 has a total of three exchange modules: the controller card; the power supply; and the hard disk assembly, which consists of the hard disk and the analog card. At first glance the Hard Disk 20 may appear to be simple to troubleshoot; however, there are a few important things you need to do and to be aware of before starting.

1. Be sure to stress to your customers the importance of backing up all files on diskette. This will make your job easier and the customer a lot happier if the hard disk becomes faulty.

2. If you need to reinitialize (or erase) the hard disk, everything stored on the hard disk will be removed permanently. This is the major reason for keeping backup diskettes.

   If the customer has not backed up his files and the hard disk will not come ready after following the troubleshooting flowcharts, the information that was stored is gone.

   If the customer has not backed up his files and the hard disk comes ready but some files are not accessible, back up as much information onto diskettes as you can. Then reinitialize (or erase) the hard disk and reinstall the customer's files.

3. Be sure to use a **KNOWN GOOD** Hard Disk 20 Startup diskette. If in doubt try different software.

   Bad software can give the appearance of a mechanical failure.

4. Be sure to test on a **KNOWN GOOD** Macintosh. Once the hard disk is functioning properly, test it with the customer's Macintosh.

5. When returning the hard disk assembly for exchange, it **MUST BE** shipped in Apple-approved packaging. Save the exchange hard disk assembly boxes and packaging materials for future use.

REFER TO THE HARD DISK 20 USER'S MANUAL FOR MORE INFORMATION ON PERFORMING BACKUP AND REINITIALIZATION.

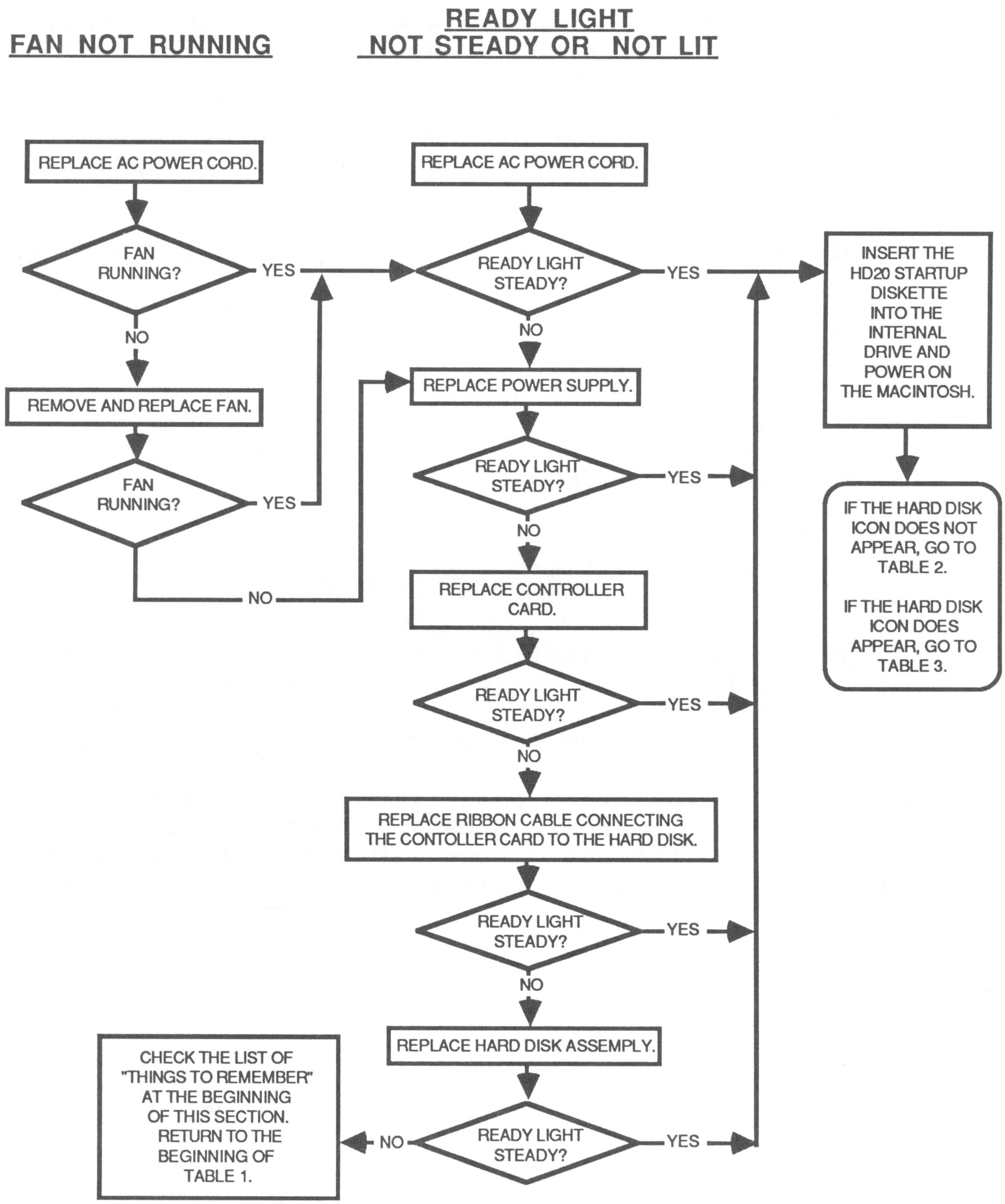
HOW TO USE THE TABLES

Set up and start up the Hard Disk 20 (see **Section 1, Basics**). Examine the hard disk and/or Macintosh for the following indications of problems. Turn to the appropriate table for instructions. Step-by-step instructions for recommended replacements and repairs to software can be found by consulting the tables of contents of the appropriate sections.

CAUTION: When you reinitialize (or erase) a customer's hard disk, everything will be removed. When installing an exchange hard disk assembly, you will have to initialize the disk and reinstall the customer's backed up files.

CAUTION: The interface cable from the controller board to the hard disk is not a standard ribbon cable. Do not substitute a different ribbon cable for this connection. Replace only with the specified cable from the parts list.

TABLE 1



FAN NOT RUNNING
READY LIGHT NOT STEADY OR NOT LIT
REPLACE AC POWER CORD.
FAN RUNNING?
YES
NO
REMOVE AND REPLACE FAN.
FAN RUNNING?
YES
NO
REPLACE AC POWER CORD.
READY LIGHT STEADY?
YES
NO
REPLACE POWER SUPPLY.
READY LIGHT STEADY?
YES
NO
REPLACE CONTROLLER CARD.
READY LIGHT STEADY?
YES
NO
REPLACE RIBBON CABLE CONNECTING THE CONTOLLER CARD TO THE HARD DISK.
READY LIGHT STEADY?
YES
NO
REPLACE HARD DISK ASSEMPLY.
READY LIGHT STEADY?
YES
NO
CHECK THE LIST OF "THINGS TO REMEMBER" AT THE BEGINNING OF THIS SECTION. RETURN TO THE BEGINNING OF TABLE 1.
INSERT THE HD20 STARTUP DISKETTE INTO THE INTERNAL DRIVE AND POWER ON THE MACINTOSH.
IF THE HARD DISK ICON DOES NOT APPEAR, GO TO TABLE 2.
IF THE HARD DISK ICON DOES APPEAR, GO TO TABLE 3.

TABLE 2

HARD DISK ICON DOES NOT APPEAR ON THE MACINTOSH DISPLAY

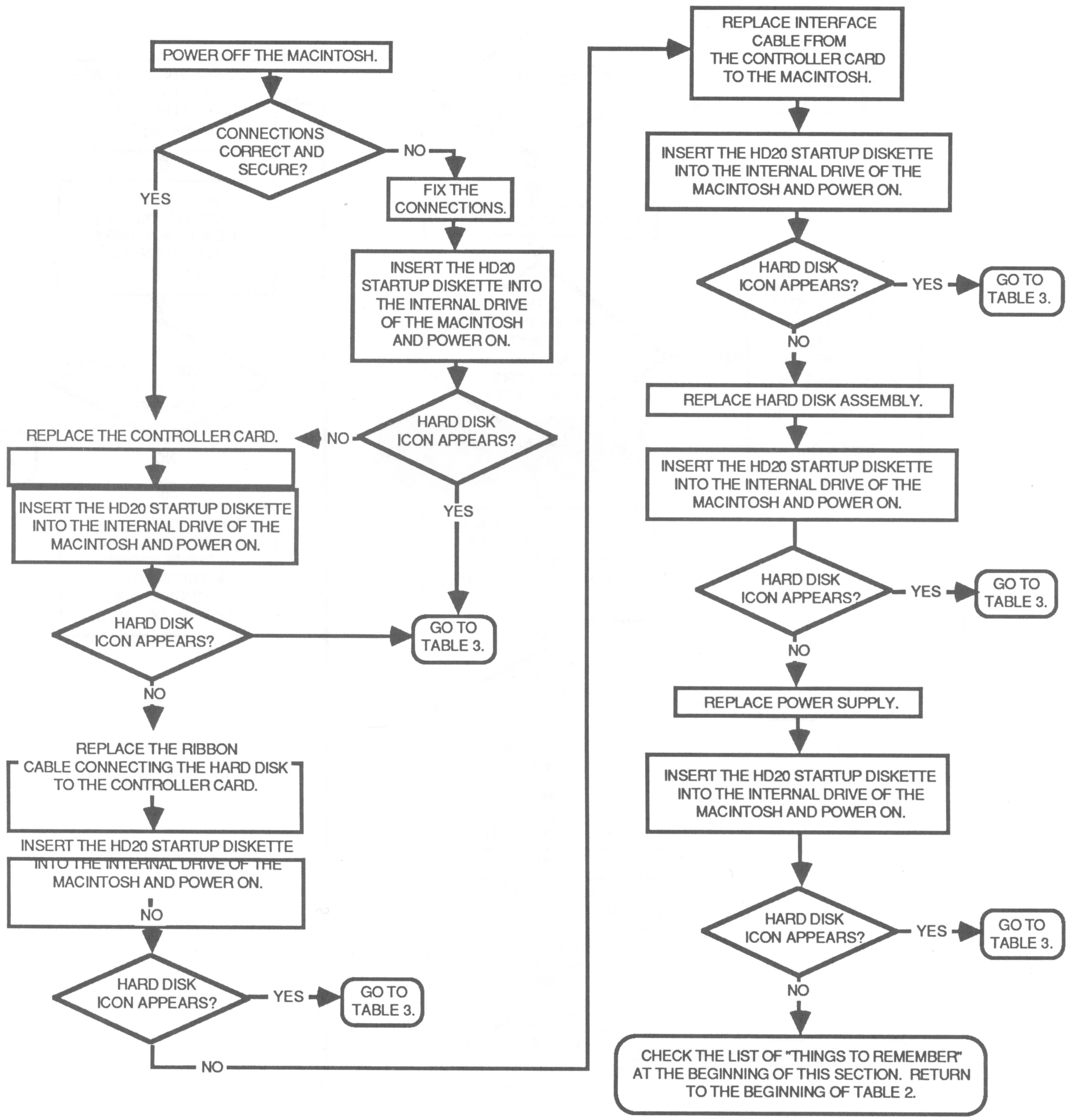


TABLE 3

HARD DISK ICON APPEARS BUT DISK IS NOT EJECTED

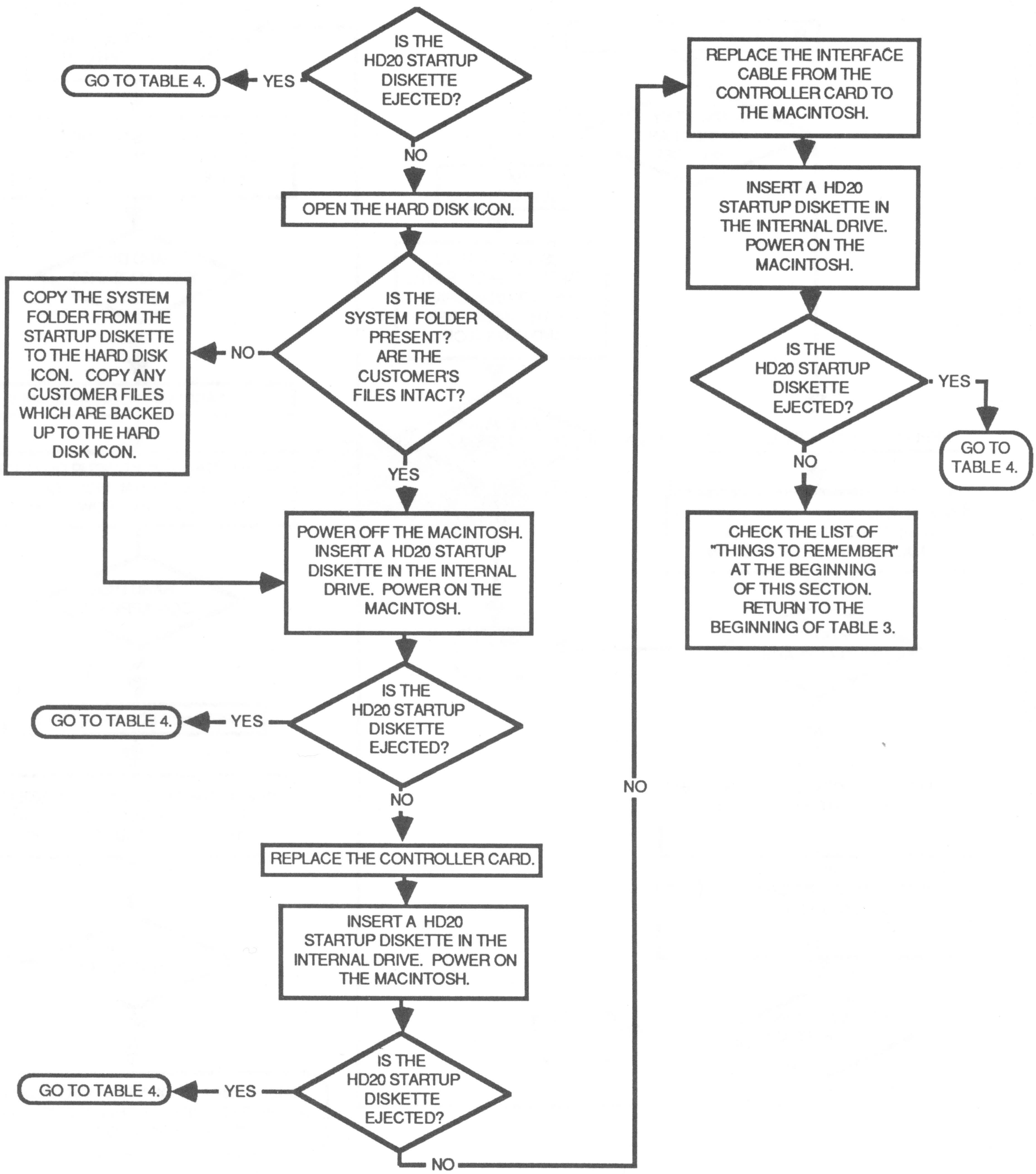
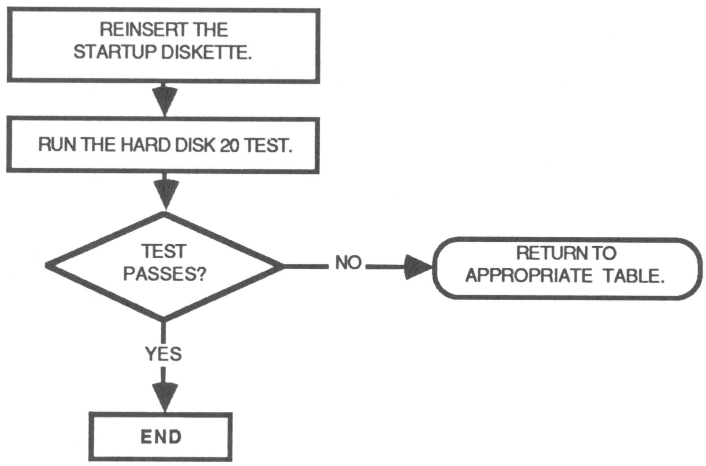


TABLE 4

FINAL TESTING



Hard Disk 20 Technical Procedures

Section 4

Take-Apart

Contents:

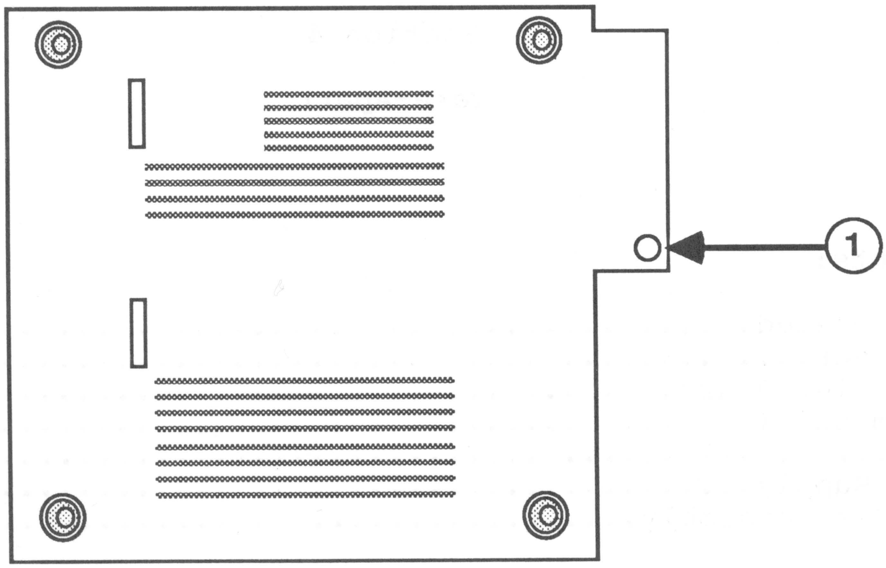


FIGURE 1

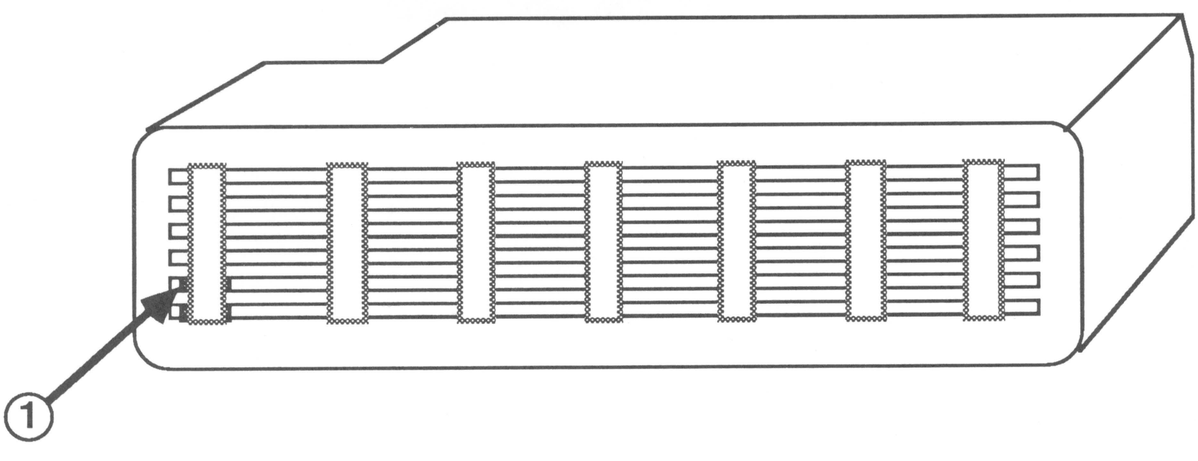


FIGURE 2

TOOLS NEEDED

The following will be needed for the take-apart procedures:

Macintosh pull-apart tool
Macintosh torx driver
A #2 phillips screwdriver
A jeweler's screwdriver
A medium flathead screwdriver

REMOVE AND REPLACE TOP COVER

Remove

1. Gently place the Hard Disk 20 upside down.

2. Remove the one torx screw shown in Figure 1, #1.

3. Locate the two tabs, one on each side of the hard disk (see Figure 2, #1).

4. Gently insert a jeweler's screwdriver to release one of the tabs, and use the Macintosh pull-apart tool to lift the cover up. Repeat this for the other side of the hard disk.

5. Pull the cover back and lift it free.

Replace

1. Slide the cover towards the front and gently push it into place.

   You will hear a "pop" when the tabs interlock.

2. Replace the screw shown in Figure 1, #1.

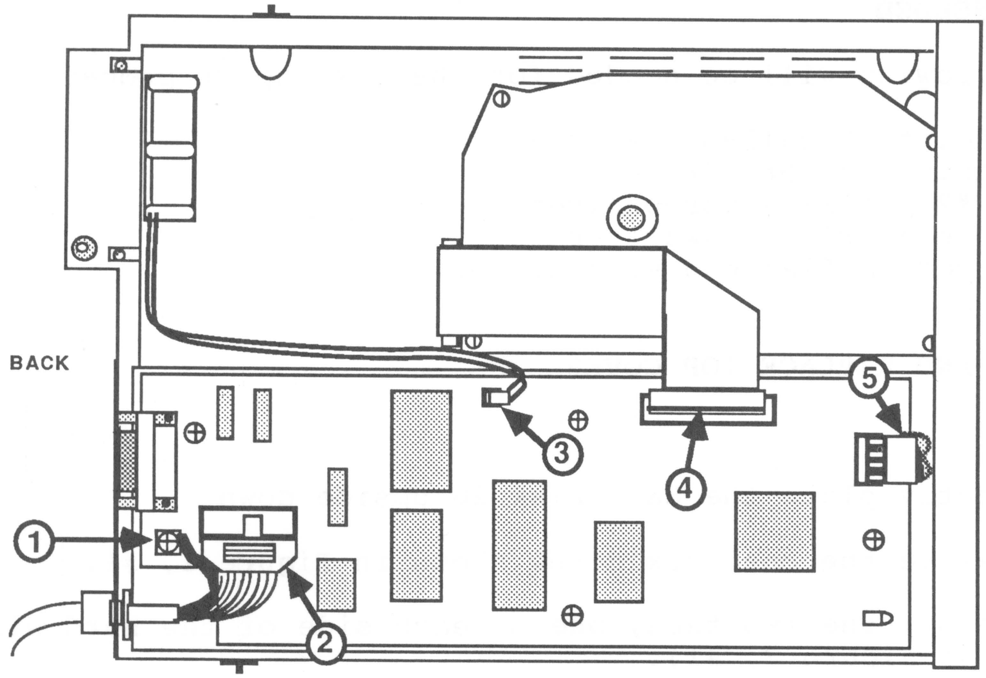


FIGURE 3

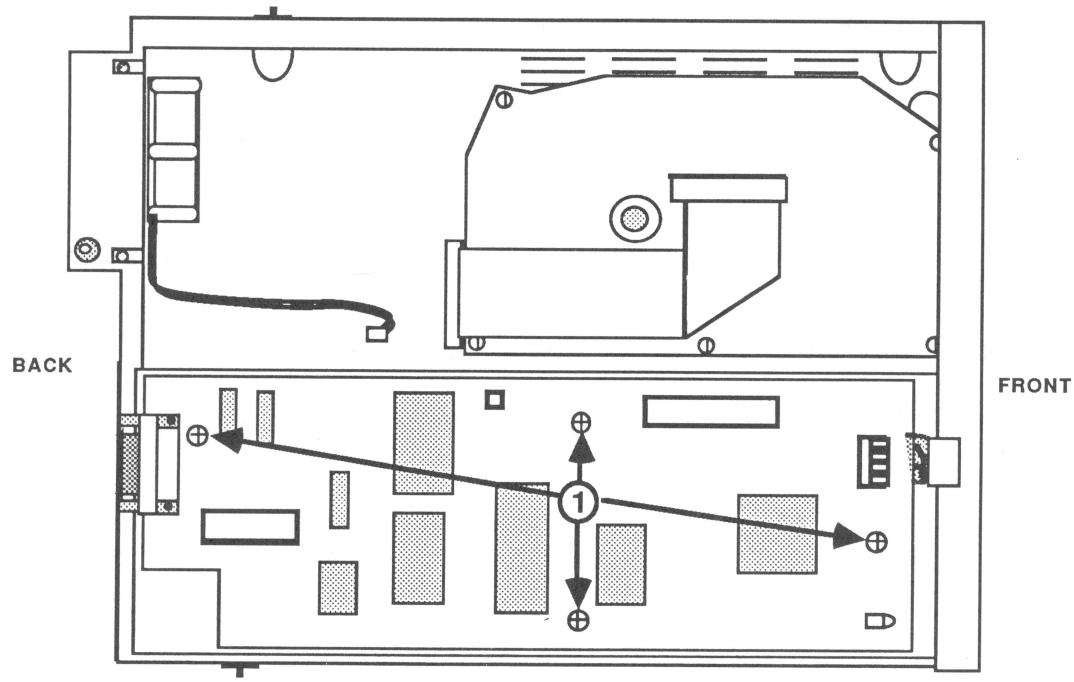


FIGURE 4

REMOVE AND REPLACE THE CONTROLLER BOARD

Remove

1. Remove the top cover.
2. Remove the grounding screw (see Figure 3, #1).
3. Disconnect the interface cable and remove it (see Figure 3, #2).
4. Unplug the fan connector (see Figure 3, #3).
5. Disconnect the interface cable from the controller board to the hard disk (see Figure 3, #4).
6. Unplug the power supply connector (see Figure 3, #5).
7. Remove the four screws (see Figure 4, #1).
8. Lift off the controller board.

Replace

1. Place the controller board on top of the power supply so the standoffs line up.
2. Replace the four screws (see Figure 4, #1).
3. Plug in the power supply connector (see Figure 3, #5).
4. Connect the interface cable from the hard disk to the controller board (see Figure 3, #4).
5. Plug in the fan connector (see Figure 3, #3).
6. Reposition the interface cable and connect it (see Figure 3, #2).
7. Replace the grounding screw (see Figure 3, #1).
8. Replace the top cover.

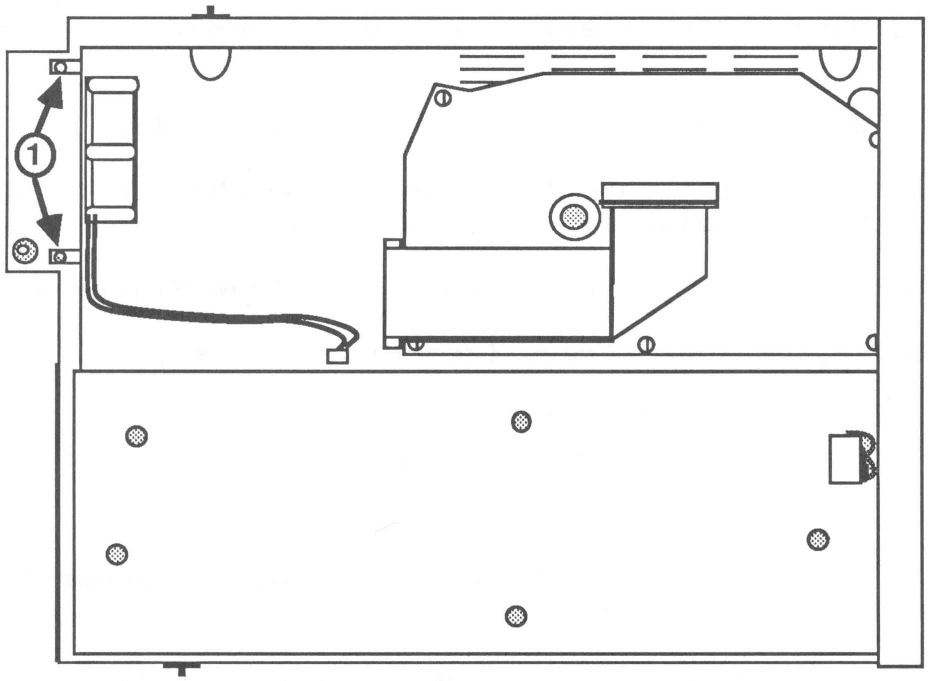


FIGURE 5

REMOVE AND REPLACE BOTTOM SHIELD

Remove

1. Remove the top cover.

2. Remove the controller board.

3. Remove the two screws (see Figure 5, #1).

4. Gently tilt and lift the bottom shield (with the power supply and hard disk attached) out of the plastic case.

Replace

1. Gently position and place the bottom shield (with the power supply and hard disk attached) into the plastic case.

2. Replace the two screws (see Figure 5, #1).

3. Replace the controller board.

4. Replace the top cover.

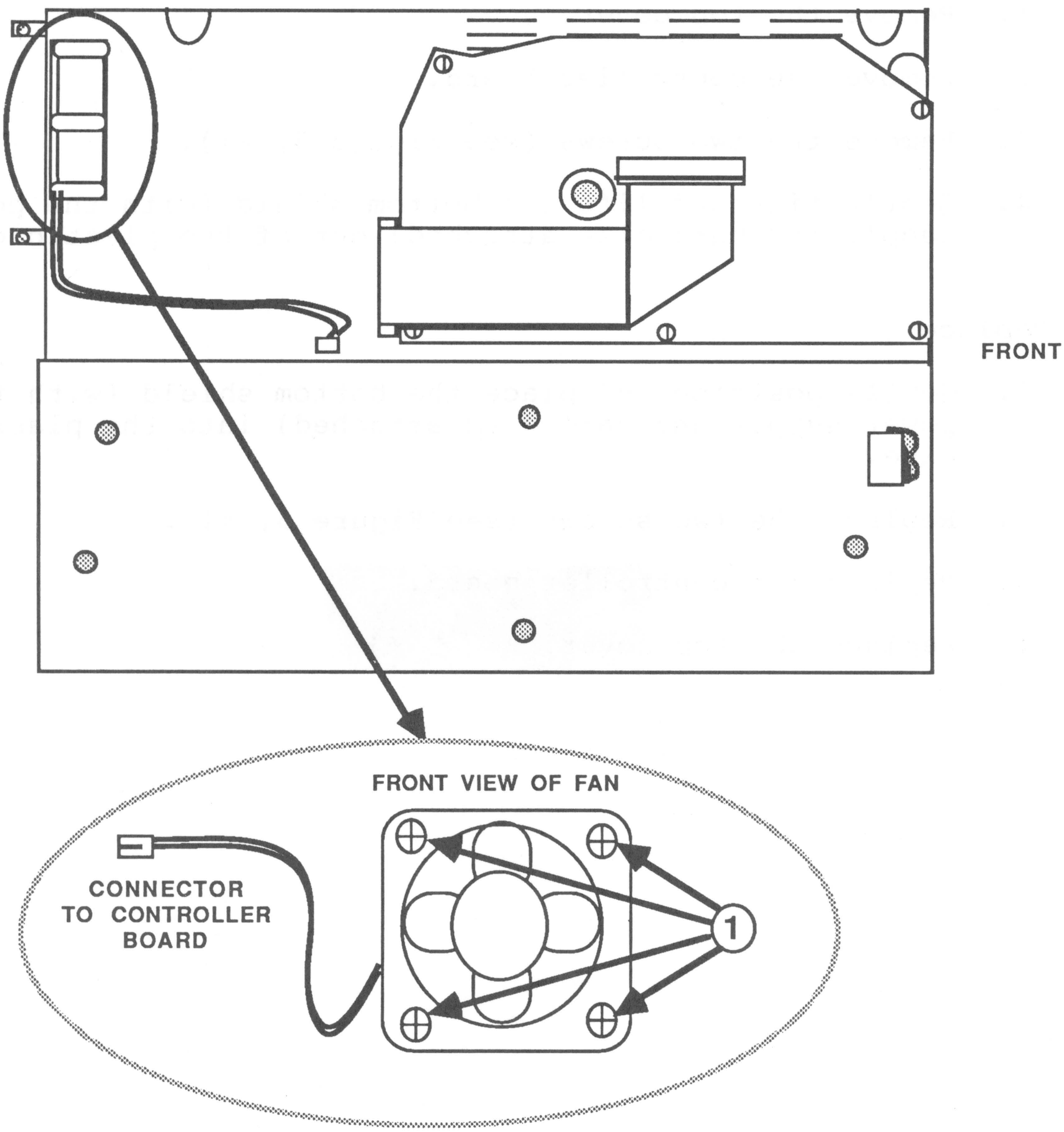


FIGURE 6

REMOVE AND REPLACE THE FAN

Remove

1. Remove the top cover.

2. Remove the controller board.

3. Remove the bottom shield.

4. Remove the four screws holding the fan in place (see Figure 6, #1).

5. Remove the fan.

Replace

1. Position the fan so that the air flow arrow embossed on the side of the fan is pointing to the rear of the machine and the rotation arrow embossed on the side of the fan is pointing up.

2. Replace the four screws (see Figure 6, #1).

3. Replace the bottom shield.

4. Replace the controller board.

5. Replace the top cover.

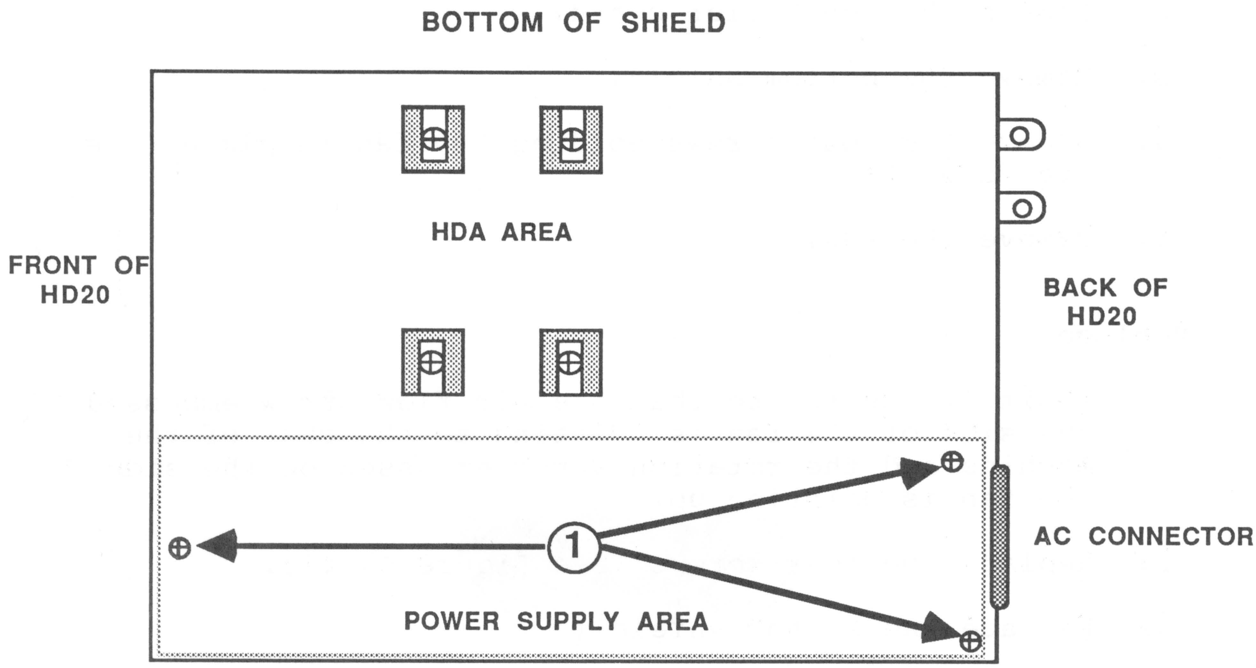

BOTTOM OF SHIELD
HDA AREA
FRONT OF
HD20
BACK OF
HD20
AC CONNECTOR
1
POWER SUPPLY AREA

FIGURE 7

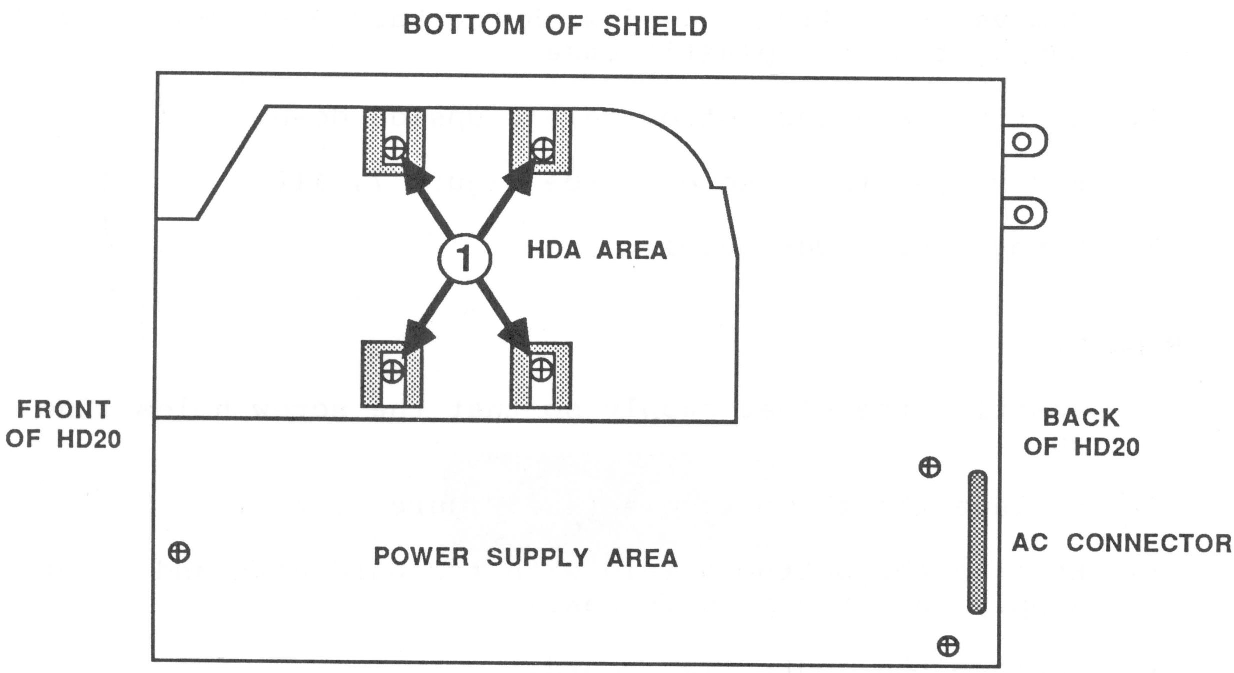
REMOVE AND REPLACE THE POWER SUPPLY

Remove

1. Remove the top cover.
2. Remove the controller board.
3. Remove the bottom shield with the hard disk and power supply from the plastic case.
4. Gently place the bottom shield upside down.
5. Remove the three screws (see Figure 7, #1).
6. Remove the power supply.

Replace

1. Position the power supply so that the screw holes line up.
2. Replace the three screws (see Figure 7, #1).
3. Replace the bottom shield with the hard disk and power supply into the plastic case.
4. Replace the controller board.
5. Replace the top cover.



BOTTOM OF SHIELD
1
HDA AREA
FRONT
OF HD20
BACK
OF HD20
POWER SUPPLY AREA
AC CONNECTOR

FIGURE 8

REMOVE AND REPLACE THE HARD DISK ASSEMBLY

Remove

1. Remove the top cover.

2. Remove the controller board.

3. Remove the bottom shield (with the hard disk and power supply attached) from the plastic case.

4. Gently place the bottom shield upside down.

CAUTION The interface cable from the controller board to the hard disk is not a standard ribbon cable. Do not substituite a different ribbon cable for this connection. Replace only with the specified cable from the parts list. Failure to do this can result in serious damage to the hard disk and/or controller board.

5. Remove the interface cable.

6. Remove the four screws (see Figure 8, #1).

7. Remove the hard disk assembly.

Replace

1. Position the hard disk assembly so the screw holes line up with the bottom shield.

2. Replace the four screws (see Figure 8, #1).

3. Connect the interface cable to the hard disk assembly.

4. Replace the bottom shield (with the hard disk and power supply attached) into the the plastic case.

5. Replace the controller board.

6. Replace the top cover.

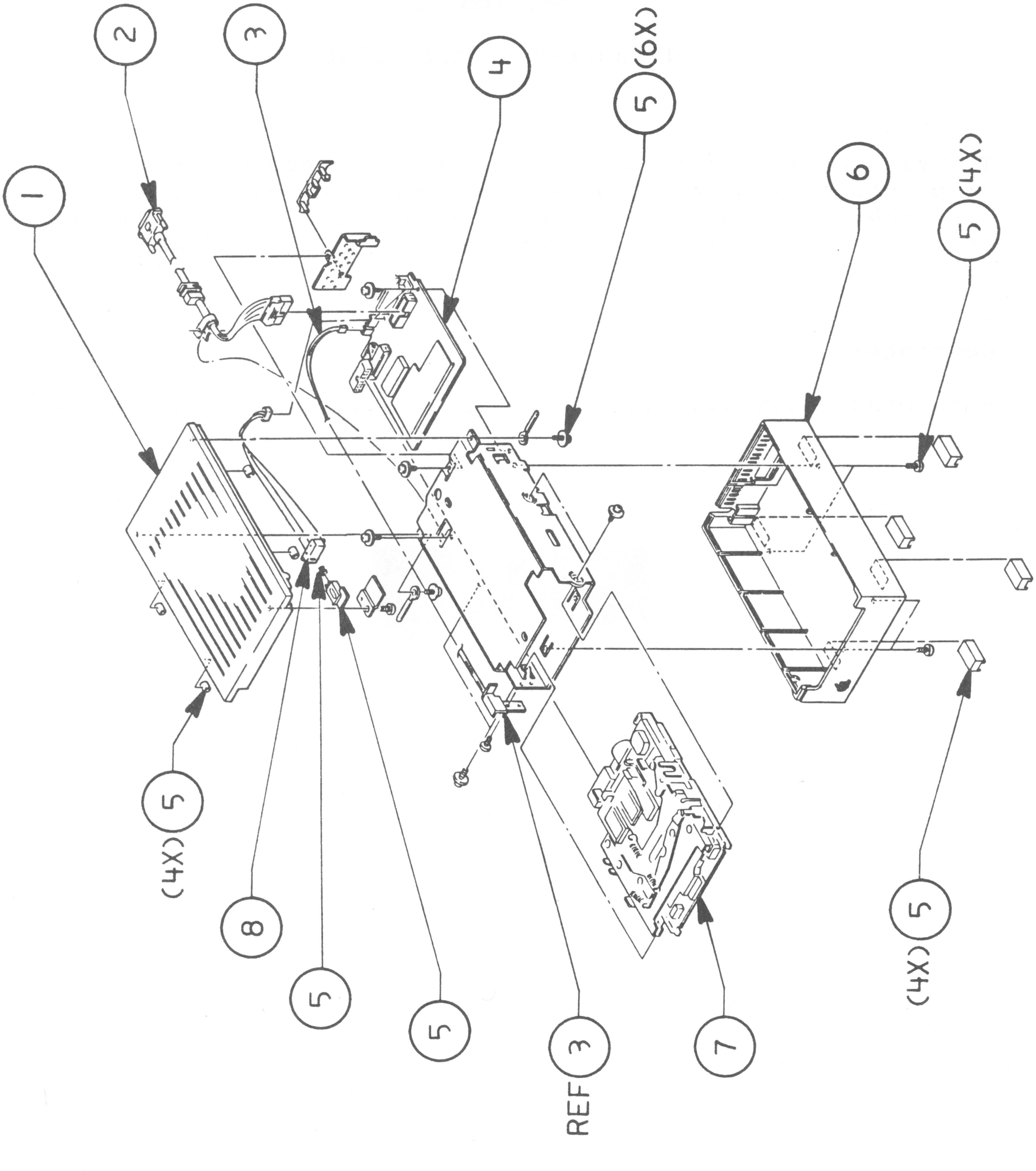
Hard Disk 20 Technical Procedures

Section 5

Illustrated Parts List

The figures and lists below include all piece parts that can be purchased separately from Apple for the Unidisk, along with their part numbers. These are the only parts available from Apple. Refer to your Apple Service Programs manual for prices.

Contents:


1
2
3
4
5 (6X)
6
5 (4X)
7
REF 3
5
5
8
(4X) 5
(4X) 5

HARD DISK 20

Item	Part No.	Description
1	815-0923	Top Cover
2	410-1306	Screw (controller + lug)
3	661-0300	HD 20 Controller Board
4	661-0301	HD 20 Power Supply
5	590-0324	Cable, HD 20 to Macintosh
6	415-3306	Screw (power supply)
7	630-5193	Bottom Cover
8	422-1007	Screw (case)
9	590-0260	Cable, Power
10	462-3103	Screw (fan)
11	720-5001	Fan
12	440-6105	Screw (Rodime)
13	462-4100	Screw (chassis to plastic)
14	590-0336	Cable, HDA to Controller
15	661-0302	HDA, 20 Meg, with Analog Board

UniDisk 3.5

UNIDISK 3.5 TECHNICAL PROCEDURES

TABLE OF CONTENTS

UniDisk 3.5 Technical Procedures

Section 1

Basics

INTRODUCTION

The UniDisk™ 3.5 disk drive is a double-sided drive providing 800 kilobytes of storage per diskette for the Apple® IIe and IIc personal computers. Using the ProDOS® Operating System, UniDisk 3.5 can easily transfer formatted data files between the 5 1/4" diskettes and the 3.5" higher capacity diskettes.

DRIVE MECHANISM PACKAGING

When sending the drive mechanism in for exchange, it **MUST** be shipped in the Apple-approved packaging, which includes the 800K drive shield and the protective packaging disk.

UniDisk 3.5 Technical Procedures

Section 2

Diagnostics

Contents:

INTRODUCTION

The ProDOS User's Diskette will be used for testing the various functions of the UniDisk 3.5. This section is divided into three procedures. The first procedure will have you format a diskette in the UniDisk 3.5 and copy two files from the 5 1/4" ProDOS User's Diskette onto the formatted diskette in the UniDisk 3.5. The second procedure will have you boot directly from the UniDisk 3.5 using the boot diskette you just created. The third procedure will have you save and delete a file from the same diskette. If the UniDisk 3.5 displays any problems with these procedures, turn to **Section 3, Troubleshooting.**

If you are using the Apple IIc, the Monitor ROM upgrade must be installed for compatibiliy with the UniDisk 3.5 (refer to **Apple IIc Technical Procedures** for Monitor ROM upgrade procedures).

The Apple IIe must have the UniDisk 3.5 interface card installed.

NOTE: Refer to the <u>ProDOS Users Manual</u> if you are unfamiliar with ProDOS. If you prefer you may use AppleWorks after you have formatted the 3.5" diskette under ProDOS. Using AppleWorks, you can select the ProDOS prefix of the formatted 3.5" diskette and use the UniDisk 3.5 for the storage device.

FORMATTING AND COPYING

1. On the Apple IIe, install a 5 1/4" disk drive into slot 6.

   On the Apple IIc, use the internal 5 1/4" disk drive.

2. On the Apple IIe, install the UniDisk 3.5 interface card into slot 5 and connect the UniDisk 3.5.

   On the Apple IIc, connect the UniDisk 3.5 to the external drive port. It will be recognized as slot 5, drive 1.

3. Insert the ProDOS User's Diskette into the 5 1/4" disk drive. Power on the system.

   The main menu will appear.

4. Type **F** for ProDOS **Filer.**

   The **Filer** main menu will appear.

5. Type **V** for **Volume Commands.**

   The **Volume Commands** Menu will appear.

6. Type **F** for **Format a Volume.**

   A screen will appear asking which volume you wish to format.

7. On both the Apple IIe and the Apple IIc, type **5** and press **<RETURN>.**

   You have specified slot 5, drive 1.

8. Type in **TEST** as the volume name and press **<RETURN>.**

   A warning will appear on the screen notifying you that you are about to format a large volume.

9. Press **<RETURN>.**

   The UniDisk 3.5 will whirr. When the red light goes off, the formatting is complete.

10. Press **<ESC>.**

    The **Filer** menu will appear.

11. Type **F** for **File Commands.**

    The **File Command** menu will appear.

12. Type **C** for **Copy Files.**

    The **Copy Files** screen will appear. You will need to transfer two files from the ProDOS User's Diskette to the UniDisk 3.5 diskette.

13. For the first **PATHNAME:** enter **/USERS.DISK/PRODOS** and press **<RETURN>.**

14. For the second **TO PATHNAME:** enter **/TEST/PRODOS** and press **<RETURN>.**

15. Press <RETURN>.

The drives will whirr and the file **ProDOS** will be copied from the ProDOS User's Diskette to the UniDisk 3.5 diskette named Test. The message **Copy Completed** will be displayed.

16. For the first **PATHNAME:** enter **/USERS.DISK/BASIC.SYSTEM** and press **<RETURN>**.

17. For the second **TO PATHNAME:** enter **/TEST/BASIC.SYSTEM** and press **<RETURN>**.

18. Press **<RETURN>**.

The drives will whirr and the file **Basic.System** will be copied from the ProDOS User's Diskette to the UniDisk 3.5 diskette named Test. The message **Copy Completed** will be displayed.

19. Power off the system.

BOOTING FROM THE UNIDISK 3.5

Apple IIe

1. Remove the 5 1/4" disk drive interface from slot 6. Power on the system.

   The screen will display **Apple II,]** and the cursor.

2. Enter **PR#5** and press **<RETURN>**.

   The UniDisk 3.5 will come on. The screen will display **PRODOS BASIC 1.1,]** and the cursor.

Apple IIc

1. Remove the ProDOS User's Diskette from the internal drive. Power on the system.

   The UniDisk 3.5 will come on. The screen will display **PRODOS BASIC 1.1,]** and the cursor.

The UniDisk 3.5 has now been booted. Continue to the next procedure.

SAVING AND DELETING

1. Enter the following program, pressing <**RETURN**> after each line of text entered.

```
NEW
10 PRINT "SAVING AND DELETING TO THE UNIDISK 3.5."
20 PRINT "THIS IS A TEST."
30 END
```

2. Type in **SAVE TEST1** and press <**RETURN**>.

   The UniDisk 3.5 will come on and whirr. Wait until the drive light goes out before continuing.

3. Type in **CATALOG** and press <**RETURN**>.

   The screen should show the following:

```
 NAME             TYPE  BLOCKS  MODIFIED          CREATED          ENDFILE SUBTYPE

*PRODOS            SYS      30  18-SEP-84  0:00  <NO DATE>          14848
*BASIC.SYSTEM      SYS      21  18-JUN-84  0:00  <NO DATE>          10240
 TEST1             BAS       1  <NO DATE>        <NO DATE>             20

BLOCKS FREE: 1541     BLOCKS USED:   59     TOTAL BLOCKS: 1600
```

4. Type in **DELETE TEST1** and press <**RETURN**>.

   The UniDisk 3.5 will come on and whirr. Wait until the drive light goes out before continuing.

5. Type in **CATALOG** and press <**RETURN**>.

   The screen should show the following:

```
 NAME             TYPE  BLOCKS  MODIFIED          CREATED          ENDFILE SUBTYPE

*PRODOS            SYS      30  18-SEP-84  0:00  <NO DATE>          14848
*BASIC.SYSTEM      SYS      21  18-JUN-84  0:00  <NO DATE>          10240

BLOCKS FREE: 1542     BLOCKS USED:   58     TOTAL BLOCKS: 1600
```

6. Repeat the saving and deleting twice to ensure there is no problem with the UniDisk 3.5.

IF THE UNIDISK 3.5 IS ABLE TO ACCOMPLISH THE ABOVE PROCEDURES WITHOUT PROBLEMS, THE UNIDISK 3.5 IS FUNCTIONING PROPERLy.

UniDisk 3.5 Technical Procedures

Section 3

Troubleshooting

Contents:

THINGS TO REMEMBER

1. When exchanging a drive mechanism, you must package it as specified in **Section 1, Basics.**

2. The UniDisk 3.5 will only work with ProDOS based applications and files.

3. The Apple IIc **MUST** have the Monitor ROM upgrade to work correctly with the UniDisk 3.5. Refer to the **Apple IIc Technical Procedures** for Monitor ROM upgrade procedures.

4. The Apple IIc recognizes the UniDisk 3.5 as being in slot 5, drive 1.

5. The Apple IIe must use the UniDisk 3.5 Apple IIe Interface Card to connect to the UniDisk 3.5. The location of the interface card determines the slot assignment.

UNIDISK 3.5 SYMPTOM CHART

The UniDisk 3.5 has three replaceable exchange modules (the drive mechanism, the controller board, and the interface card for the Apple IIe) and three replacement parts (the external drive cable, the micro-switch eject cable assembly, and the LED cable assembly).

Two general rules for troubleshooting the UniDisk 3.5 are:

1. Use known good software. (It can save you a lot of time!)

2. Be sure you are addressing the correct slot (refer to #4 and #5 in **Things to Remember**).

If the UniDisk 3.5 demonstrates a symptom listed below, replace the module or part listed under the corrective action(s) in the order listed. If a corrective action does not fix the problem, the original board should be reinstalled before doing the next step.

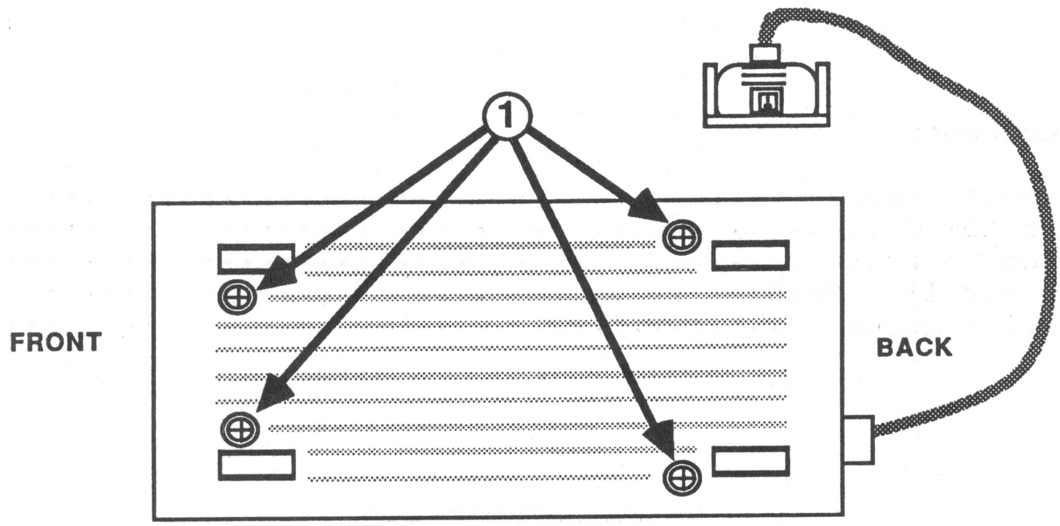
SYMPTOM	CORRECTIVE ACTION
Drive will not come on. LED flashes once or does not light.	1. Swap interface card (IIe) 2. Swap controller card 3. Swap drive mechanism 4. Swap external drive cable 5. Swap LED assembly
Drive will read but not write.	1. Swap drive mechanism 2. Swap controller card 3. Swap interface card (IIe) 4. Swap external drive cable
Drive will not read, but LED comes on.	1. Check software 2. Swap drive mechanism 3. Swap controller card 4. Swap interface card (IIe)
Drive will not eject diskette.	1. Swap drive mechanism 2. Swap micro-eject switch assembly
Drive functions, but LED is not lit.	1. Swap LED assembly 2. Swap drive mechanism 3. Swap controller card

UniDisk 3.5 Technical Procedures

Section 4

Take-Apart

Contents:



BOTTOM VIEW

FIGURE 1

TOOLS NEEDED

The following will be needed for the take-apart procedures:

- #2 Phillips screwdriver, magnetized
- Small Phillips screwdriver
- Small flathead screwdriver
- Small needlenose pliers

REMOVE AND REPLACE BOTTOM COVER

Remove

1. Set the UniDisk 3.5 upside down.
2. Remove the four screws (see Figure 1, #1).
3. Hold the external cable in place and lift the bottom panel off.

Replace

1. Position the bottom cover, hold the external cable and slide the bottom cover into place.
2. Replace the four screws (see Figure 1, #1).

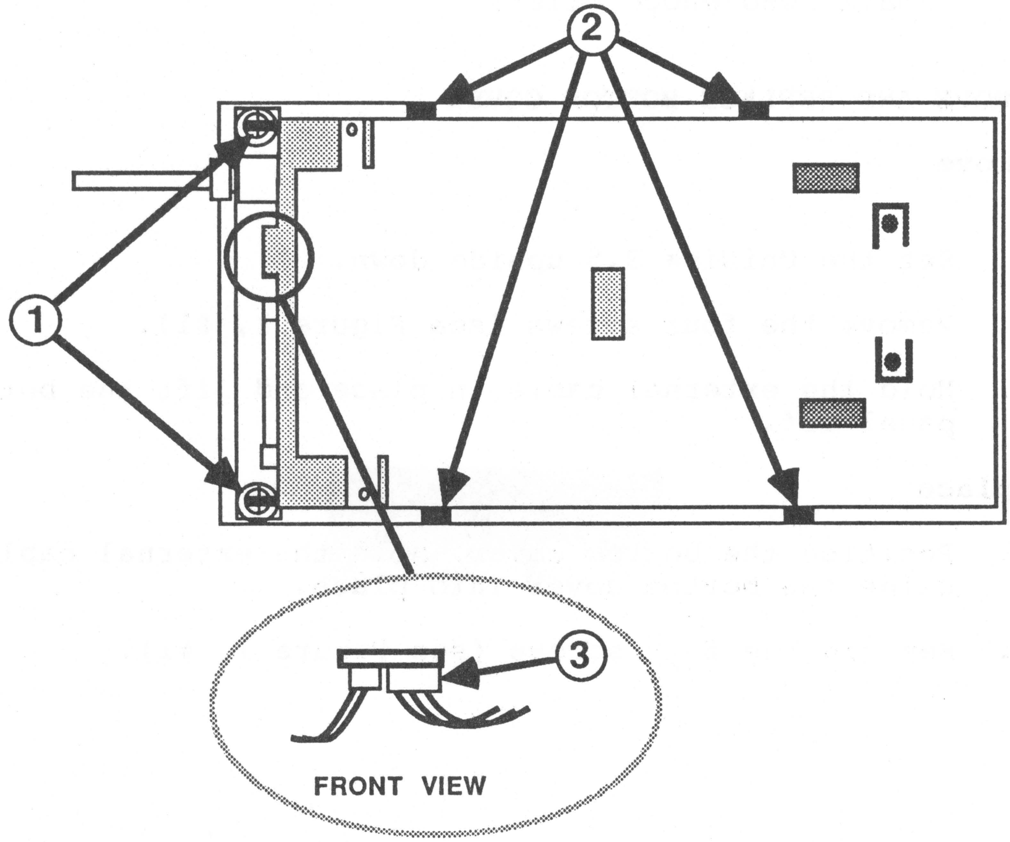


FIGURE 2

REMOVE AND REPLACE TOP COVER

Remove

1. Remove the bottom cover.

2. There are washers with black wire guides connected to them which are held in place by the screws. Bend the black wire guides on top of each screw out of the way (see Figure 2, #1) and remove the two screws (see Figure 2, #1).

3. Remove the four small black rubber guides from the sides of the case with needlenose pliers (see Figure 2, #2).

5. DO NOT PULL ON THE WIRES. Disconnect the eject button connector (see Figure 2, #3) by gently prying off the connector with a small flathead screwdriver.

6. Lift the entire metal case from the top cover.

Replace

1. Position the metal case onto the top cover. There is a hole in the upper RFI shield which fits over a plastic tab located towards the front of the top cover. Be sure the LED and eject button wires can be seen on each side of the case.

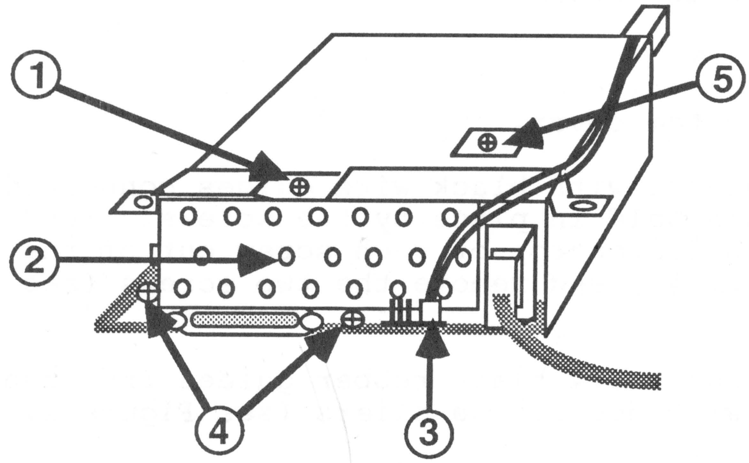
2. Replace the two screws and the washers with the black guides to hold the wires in position (see Figure 2, #2).

3. Replace the four black rubber guides to hold the wires in position (see Figure 2, #2).

4. Connect the eject button connector (see Figure 2, #3).

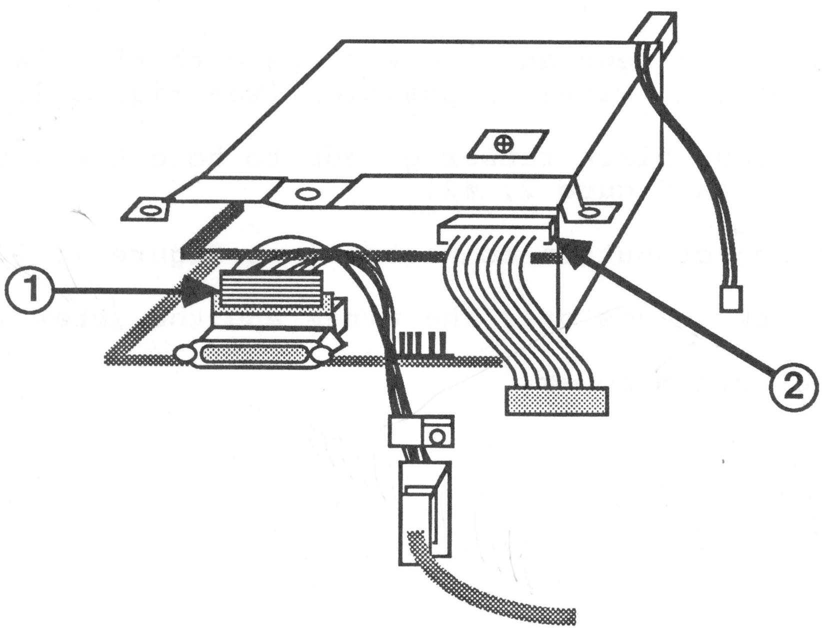
5. Bend the black guides over the wires and the screws.

6. Replace the bottom cover.



BACK VIEW

FIGURE 3



BACK VIEW

FIGURE 4

REMOVE AND REPLACE CONTROLLER CARD

Remove

1. Remove the bottom cover and the top cover.

2. Remove the one screw (see Figure 3, #1) that holds the small metal shield in position (see Figure 3, #2). Remove the shield.

3. DO NOT PULL ON THE WIRES. Disconnect the LED connector (see Figure 3, #3) by gently prying off the connector with a small flathead screwdriver.

4. Remove the two screws that hold the controller card in place (see Figure 3, #4).

5. Note the positioning and remove the one screw that holds the interface cable grounding clip in position (see Figure 3, #5).

6. Slide the controller card halfway out and disconnect the interface connector from the controller board (see Figure 4, #1).

7. Remove the cable connector plug from the analog board (see Figure 4, #2). This will free the cable which is soldered to the controller card.

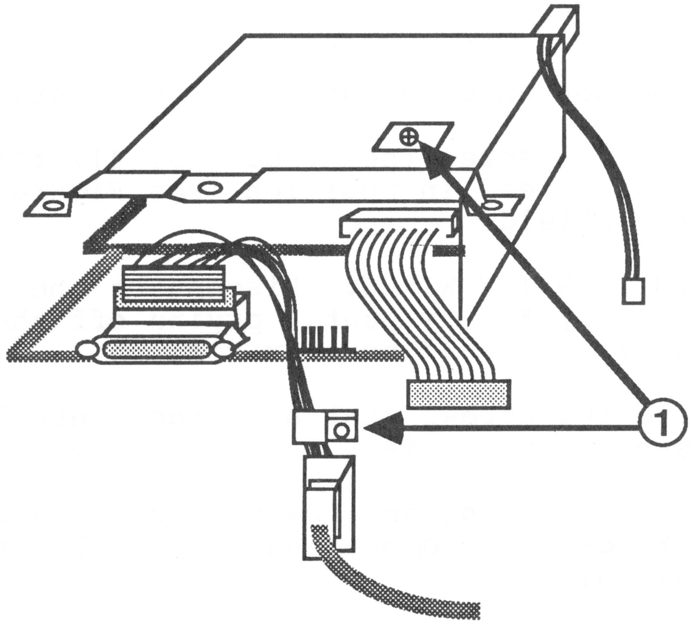
8. Slide out the controller board.

Replace

1. Slide the controller board halfway in. The board should be on top of the guides in the RFI shield.

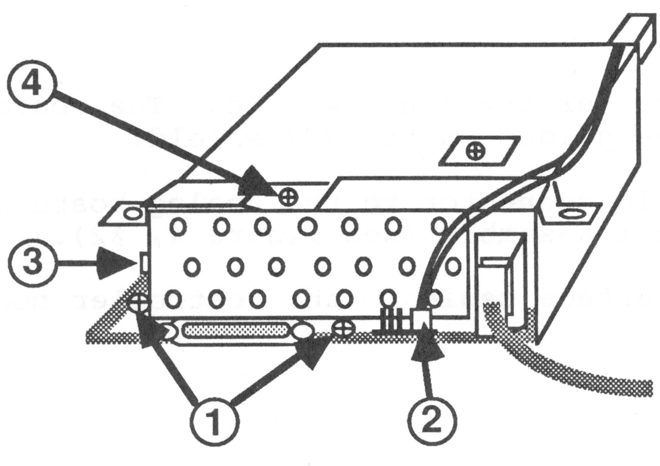
2. Connect the cable connector to the analog board mounted on the mechanical assembly (see Figure 4, #2).

3. Connect the interface cable to the controller board (see Figure 4, #1).



BACK VIEW

FIGURE 5



BACK VIEW

FIGURE 6

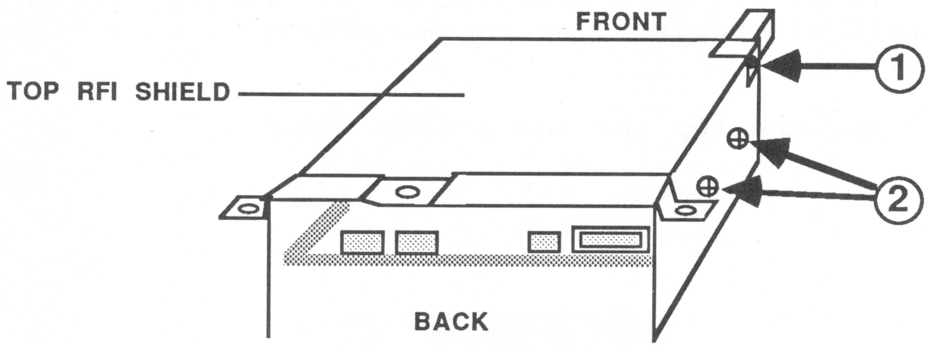
4. Slide the controller board into the assembly. Place the interface cable grounding clip on the exposed metal casing on the interface cable. Using a small pair of needlenose pliers, position the clamp onto the screw mount and replace the screw (see Figure 5, #1)

5. Replace the two screws that hold the controller card in place (see Figure 6, #1).

6. Connect the LED connector (see Figure 6, #2).

7. Insert the tab on the left of the small shield (see Figure 6, #3) into the slot on the left of the RFI shield and replace the screw holding it (see Figure 6, #4).

8. Replace the top and the bottom covers.



DRIVE MECHANISM

FIGURE 7

REMOVE AND REPLACE DRIVE MECHANISM

Remove

1. Remove both the bottom and top covers.

2. Remove controller card.

3. Using the small Phillips screwriver remove the screw that holds the LED in position (see Figure 7, #1).

4. Remove the four screws that hold the disk drive mechanism in the RFI shield. There are two screws on each side of the shield. Figure 7, #2, shows one side.

5. Slide the drive out towards the front of the shield.

Replace

1. Position the RFI shield top up and slide the drive assembly, connectors first, into the shield. The drive mechanism fits snugly between the screw mounts on the RFI shield.

2. Start the four screws that hold the disk drive mechanism to the RFI shield. After all four screws are started, tighten each one. There are two screws on each side of the shield. Figure 7, #2, shows one side.

3. Position the LED so it is facing the front and the screw hole lines up with the RFI shield screw hole. Replace the screw using the small Phillips screwdriver (see Figure 7, #1).

4. Replace the controller card.

5. Replace the top and the bottom covers.

UniDisk 3.5 Technical Procedures

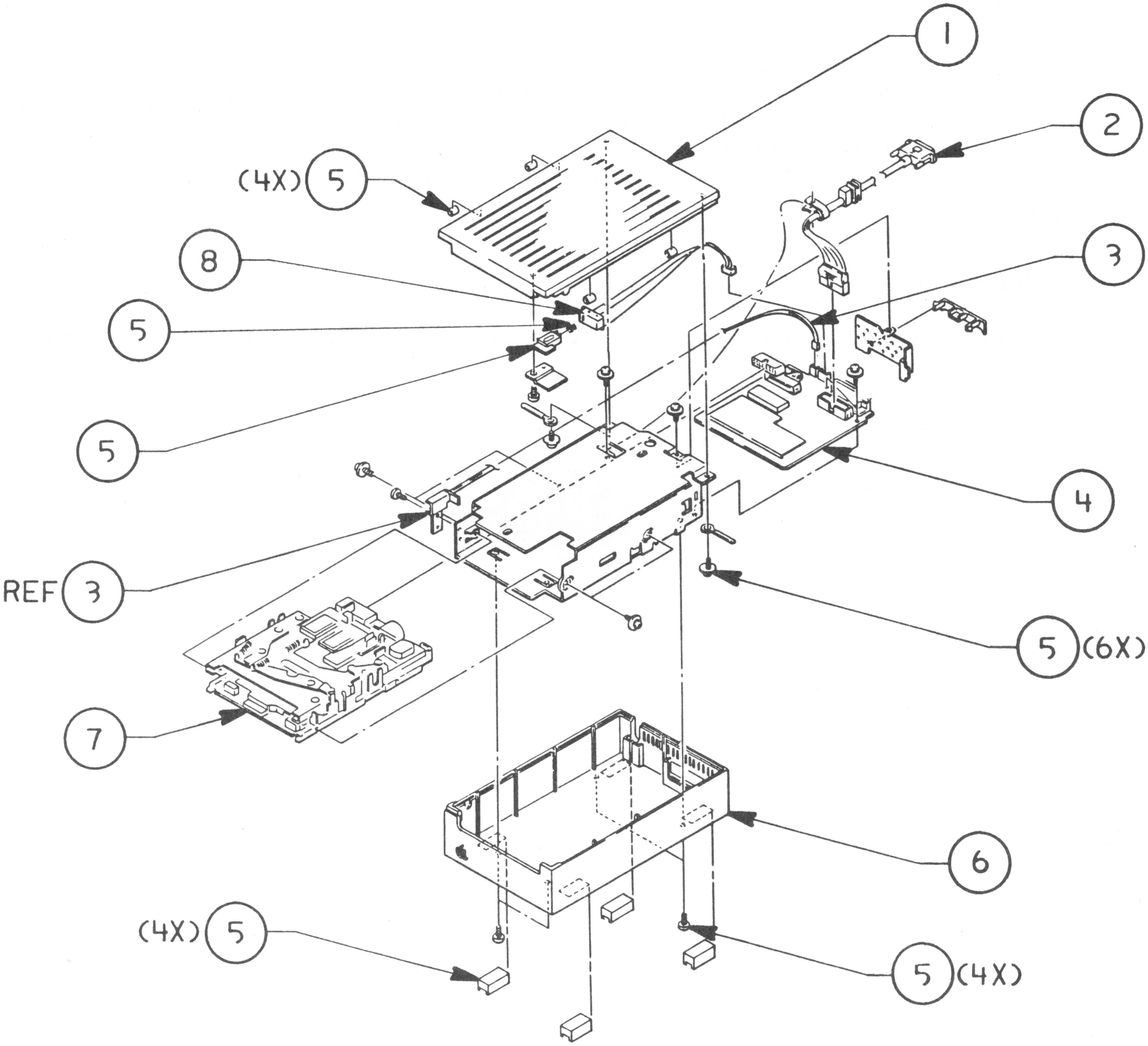
Section 5

Illustrated Parts List

The figures and lists below include all piece parts that can be purchased separately from Apple for the UniDisk 3.5, along with their part numbers. These are the only parts available from Apple. Refer to your Apple Service Programs manual for prices.

Contents:

Drwg 070-0243-00 | 1/1



UNIDISK

Item	Part No.	Description
1	815-0904	Case Top, UniDisk 3.5
2	590-0321	External Drive Cable
3	590-0100	Ass'y, LED Cable
4	661-0307	UniDisk 3.5 Controller Card
5	076-0192	Parts Set, UniDisk 3.5
6	815-0905	Case Bottom, UniDisk 3.5
7	661-0305	UniDisk 3.5 Drive Mechanism
8	590-0101	Cable Ass'y, Microswitch Eject

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